VOLUME 18 / NUMBER 16
AUGUST 23, 1980
ACC. NOS. N80-25274 TO N80-26263

STAR
AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

PRODUCED BY THE
SCIENTIFIC AND TECHNICAL
INFORMATION
BRANCH

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WHAT YOU CAN DO FOR *STAR*

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those that you will transmit to NASA, DoD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to the NASA Scientific and Technical Information Facility, P. O. Box 8757, B. W. I. Airport, Maryland 21240.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR's* companion journal, *International Aerospace Abstracts*.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on public sale at the National Technical Information Service. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

The semimonthly issues and the cumulative index issues are available postpaid on subscription and in single copy from the Superintendent of Documents, United States Government Printing Office, Washington, D.C., 20402, United States of America.

Semimonthly issues...

Annual subscription rates: $60.00 domestic; $75.00 foreign. Price per single copy: $2.50 domestic; $3.15 foreign.

Cumulative index issues, semiannual and annual...

Annual subscription rates for both: $25.00 domestic; $31.25 foreign. Price per single copy: semiannual $9.50 domestic, $11.90 foreign; annual $16.00 domestic, $20.00 foreign.

Domestic subscription rates...

Apply to the United States, Canada, Mexico, and all Central and South American countries, except as noted below.

Foreign subscription rates...

Apply to Argentina, Brazil, French Guiana, Guyana, Surinam, Belize, and all other countries throughout the world.

Payment should be by check, money order, or document coupons, and must accompany order. Remittances from foreign countries should be made by international money order or draft on an American bank, payable to the Superintendent of Documents, or by UNESCO book coupons.

PUBLISHED BY:

UNITED STATES GOVERNMENT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SCIENTIFIC AND TECHNICAL INFORMATION BRANCH
Scientific and Technical Aerospace Reports, Volume 18, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by *PRC Data Services Company*.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1981.

US ISSN 0036-8741

INTRODUCTION

Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms
- Translations in report form
- NASA-owned patents and patent applications
- Dissertations and theses

Cumulative index volumes are published semiannually and annually.

Journal, book, and conference literature, cover-to-cover journal translations, and certain foreign dissertations are announced in a companion journal, *International Aerospace Abstracts (IAA)*, available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

ON-GOING RESEARCH PROJECTS

By arrangement between NASA and the Smithsonian Science Information Exchange (SSIE), a separate section of information on aerospace-related *On-Going Research Projects* is inserted into each issue of *STAR*. The insert presents titles of active NASA grants and university contracts, summary portions of recently updated *NASA Research and Technology Objectives and Plans (RTOPs)*, and notices of non-NASA research projects that were funded in the most recent or current fiscal year. The latter are selected by SSIE. The project announcements in the insert are arranged by *STAR* divisions but are otherwise entirely separate from *STAR*. They are not indexed nor machine-searchable by NASA. Current and retrospective searches are available from SSIE, 1730 M Street, N.W., Washington, D.C. 20036.

SUBJECT SCOPE

Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

OTHER NASA PUBLICATIONS

Other NASA publications and information services are described in the publication, *The NASA Scientific and Technical Information System ... and How to Use It*, available without charge from the NASA Scientific and Technical Information Facility, P. O. Box 8757, B. W. I. Airport, Maryland 21240.

HOW TO USE STAR SUBJECT CATEGORIES

STAR is categorized by 10 major subject divisions divided into 74 specific subject categories and one general category/division. The major subject divisions are listed in the Table of Contents, together with a note for each that defines its scope and provides any cross-references. For example:

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

DOCUMENTS ON MICROFICHE

Documents on microfiche[1] are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

AVAILABILITIES

One or more sources from which a document announced in *STAR* is available to the public is given in each citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page vii.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, at the standard $3.50 price, for those documents identified by a # symbol.)

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of 50 cents each, postage free. (See discussion of patents and patent applications below.)

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report/Accession Number Index, patents are indexed by the NASA Case Number (which appears in lieu of the report number in other indexes), the U.S. Patent Number, the U.S. Patent Application Serial Number, and the U.S. Patent Class. Patent applications for which patents have not yet been issued are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

NASA *patent application specifications* are sold in paper copy by the National Technical Information Service at price code A02 ($5.00 domestic; $10.00 foreign). Microfiche are sold at price code A01 ($3.50 domestic; $5.25 foreign). The US-Patent-Appl-SN- number should be used in ordering either paper copy or microfiche from NTIS. Printed copies of *patents* (which are not microfiched) are available for purchase at 50 cents per copy from:

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and Trademark Office. The patents and patent applications announced in *STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

Assistant General Counsel for Patent Matters/Code GP-1
National Aeronautics and Space Administration
Washington, D.C. 20546

ELIGIBILITY AND REGISTRATION FOR NASA INFORMATION PRODUCTS AND SERVICES

A variety of services, in addition to the distribution of NASA scientific and technical reports and of *STAR* and its cumulative indexes, is available to organizations of the following types that have registered with NASA to receive specific services or products:

1. NASA offices, research centers, contractors, subcontractors, grantees, and consultants;

2. Other U.S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
4. Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
5. Organizations abroad that have established reciprocal document exchange arrangements with NASA.

Only the central service points or central points of document acquisition and control within qualified organizations are eligible to register for NASA products and services. Domestic organizations that may be eligible to receive various classes of NASA publications and services should address their requests for registration or for further information to:

NASA Scientific and Technical Information Facility
Attn.: Registration Activity
P.O. Box 8757
B.W.I. Airport, Maryland 21240

Organizations abroad should direct requests to the same address, but to the attention of: International Exchange Program.

AVAILABILITY OF STAR ABSTRACTS ON MICROFICHE

Microfiche of the abstract sections of this issue ahd other issues of *STAR* are available on annual subscription from NTIS, Attn: Subscriptions, 5285 Port Royal Road, Springfield, Virginia 22161. Annual subscription rates are $45.00 North America; $90.00 foreign. Abstract sections for previous years retroactive to 1964 are available at the current rates. Microfiche for individual *STAR* issue abstract sections are not available.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics
and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and
Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information
Facility
P.O. Box 8757
B. W. I. Airport, Maryland 21240

National Aeronautics and Space
Administration
Scientific and Technical Information
Branch (NST-41)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey
1033 General Services Administration
Building
Washington, D.C. 20242

U.S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

Fachinformationszentrum Energie, Physik,
Mathematik GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

NTIS PRICE SCHEDULES

Schedule A

STANDARD PAPER COPY PRICE SCHEDULE

(Effective January 1, 1980)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 3.50	$ 5.25
A02	001-025	5.00	10.00
A03	026-050	6.00	12.00
A04	051-075	7.00	14.00
A05	076-100	8.00	16.00
A06	101-125	9.00	18.00
A07	126-150	10.00	20.00
A08	151-175	11.00	22.00
A09	176-200	12.00	24.00
A10	201-225	13.00	26.00
A11	226-250	14.00	28.00
A12	251-275	15.00	30.00
A13	276-300	16.00	32.00
A14	301-325	17.00	34.00
A15	326-350	18.00	36.00
A16	351-375	19.00	38.00
A17	376-400	20.00	40.00
A18	401-425	21.00	42.00
A19	426-450	22.00	44.00
A20	451-475	23.00	46.00
A21	476-500	24.00	48.00
A22	501-525	25.00	50.00
A23	526-550	26.00	52.00
A24	551-575	27.00	54.00
A25	576-600	28.00	56.00
A99	601-up	-- 1/	-- 2/

1/ Add $1.00 for each additional 25 page increment or portion thereof for 601 pages up.

2/ Add $2.00 for each additional 25 page increment or portion thereof for 601 pages and more.

Schedule E

EXCEPTION PRICE SCHEDULE

Paper Copy & Microfiche

Price Code	North American Price	Foreign Price
E01	$ 5.50	$ 11.50
E02	6.50	13.50
E03	8.50	17.50
E04	10.50	21.50
E05	12.50	25.50
E06	14.50	29.50
E07	16.50	33.50
E08	18.50	37.50
E09	20.50	41.50
E10	22.50	45.50
E11	24.50	49.50
E12	27.50	55.50
E13	30.50	61.50
E14	33.50	67.50
E15	36.50	73.50
E16	39.50	79.50
E17	42.50	85.50
E18	45.50	91.50
E19	50.50	100.50
E20	60.50	121.50
E99	Write for quote	
N01	28.00	40.00

VOLUME 18 NUMBER 16/AUGUST 23, 1980

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 2079

02 AERODYNAMICS 2081

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 2083

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 2083

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 2084

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 2086

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 2087

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 2089

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 2090

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 2090

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS N.A.

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 2091

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 2093

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING N.A.

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 2094

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION N.A.
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 2094
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 2094
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 2095
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 2096
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 2098
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 2103
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 2105
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics*.

31 ENGINEERING (GENERAL) 2108
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 2112
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 2115
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 2120
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 2130
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources*.
For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 2132
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 2133
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 2136
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 2137
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 2142
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 2150
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 2168
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 2174
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 2178
Includes weather forecasting and modification.

48 OCEANOGRAPHY 2183
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 2184
Includes genetics.

52 AEROSPACE MEDICINE 2184
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES N.A.
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 2186
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 2186
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 2187
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS N.A.
Includes computer networks.

63 CYBERNETICS 2191
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 2192
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 2194
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 2195
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS N.A.
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) 2195
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 2195
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS 2196
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 2198
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS 2199
Includes light phenomena.

75 PLASMA PHYSICS 2201
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS 2204
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS 2207
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT N.A.
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 2207
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS 2208
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 2208
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 2208
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 2211
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 2213
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2214
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 2215
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 2215
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

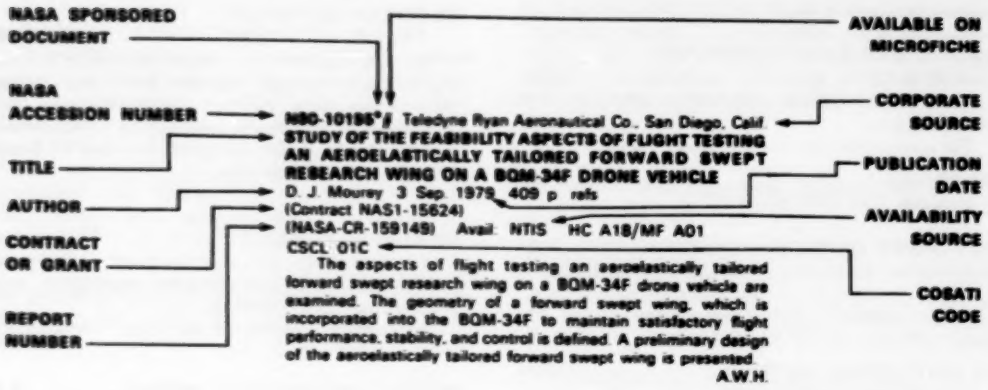
GENERAL

99 GENERAL 2216

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-57
CORPORATE SOURCE INDEX I-65
CONTRACT NUMBER INDEX I-79
REPORT/ACCESSION NUMBER INDEX I-83

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER
N80-10195*// Teledyne Ryan Aeronautical Co., San Diego, Calif.
CORPORATE SOURCE
TITLE
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
PUBLICATION DATE
AUTHOR
D. J. Mourey 3 Sep. 1979 409 p refs
(Contract NAS1-15624)
AVAILABILITY SOURCE
CONTRACT OR GRANT
(NASA-CR-159149) Avail: NTIS HC A18/MF A01
CSCL 01C
COSATI CODE
REPORT NUMBER
The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, BOOST SUSTAIN INTEGRATION STUDY
T. Piercy, Marquardt Co., *16555 Saticoy St., Van Nuys, California* 91409 (DF462490; F33615-78-C-2034)

Study the possibility of combining the separate propulsion stages of boost and sustain into a single propulsion unit for ramjets (solid fuel, liquid fuel and ducted rocket). Eliminate booster ejectables during boost-to-sustain transition phase.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0002, FURTHER WIND TUNNEL INVESTIGATIONS OF A WING/STORE FLUTTER SUPPRESSION SYSTEM
C. Hwang, Northrop Corp., *3901 W. Broadway, Hawthorne, California* 90250 (DF142180; F33615-78-C-3221)

High performance fighter attack aircraft are required to carry many combinations of external wing mounted stores to obtain operational effectiveness in the combat role. However, some wing/store configurations are found to be critical from the standpoint of preventing flutter from occurring within the desired operational flight envelope. Speed placards are presently the only means of preventing this flutter, but this technique generally results in significant losses in aircraft performance. The objective of this program is to conduct wind tunnel tests on an aeroelastic model with external stores to further investigate critical parameters. The technology gained from this program will ultimately result in an expanded attack envelope, increased survivability (reduced cost per target kill), and improved operational flexibility on fighter attack aircraft with an air-to-ground mission.

The existing flutter model will be refurbished to include additional sensors, new control surface actuators, and new and improved control laws. In order to prevent severe damage to the model if flutter is unexpectedly encountered, a new store with a movable mass will be designed and fabricated, and will be controlled by an automatic flutter sensing unit. Additional analytical studies will be conducted to develop the new control laws which could possibly include AFFDL, French and British control laws. Two test entries will be performed with the cooperation of NASA Langley at the 16-foot transonic dynamics tunnel. These tests will be conducted to evaluate the control laws described earlier as well as adaptive control laws which will be developed under a separate AFFDL contract.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0003, IMPROVED HIGH AOA DESIGN GUIDES AND FLYING QUALITIES CRITERIA
I.L. Ashkenas, Systems Technology Inc., *13766 S. Hawthorne Blvd., Hawthorne, California* 90250 (DF137370; F33615-78-C-3604)

The mission to be supported is FG02, Development and Improvement of Flight Control Design Techniques. One problem area experienced by aircraft designers is their inability to adequately predict high-angle-of-attack characteristics. The objective of this effort is to improve the methods available to predict and quantitatively define aircraft flying qualities at high angles of attack. The results will be applicable to updating military specifications, as well as providing design guides for future high-performance military aircraft using either conventional or CCV control system concepts.

The effort consists of both gathering and analyzing existing data required to provide new and/or improved high-angle-of-attack (AOA) flying qualities requirements and design guides for all categories of aircraft. The effort will begin with an extensive literature survey of the technical area and a critical review of the high-AOA requirements of MIL-F-8785B. This will be followed by a comprehensive series of personal visits to various organizations within the USAF, Navy, NASA, industry, and the academic community to obtain ideas and data. From this data a revised high-AOA flying qualities specification will be formulated. The design guides effort consists of gathering high-AOA design guides from cognizant sources in the technical community and performing appropriate analysis for verification. Presently used guides as well as planned improvements or potential new guides shall be considered. The results will be presented in compendium form.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0004, F100 HPC AEROELASTIC ANALYSIS
J. Jeffers, United Technologies Corp., *P.O. Box 2691, West Palm Beach, Florida* 33402 (DF461950; F33615-77-C-2105)

Improve understanding of blade flutter mechanisms by providing insight into parameters affecting blade instability.

Conduct a detailed aero/mechanical analysis of FX-208 and XD-11 test data generating a stall and choke flutter data bank for prediction system development, evaluate existing prediction system capabilities/limitations, and assess the use of 'core' engines for full-scale engine HPC flutter clearance testing.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0005, COOLED HOLLOW CERAMIC AIRFOIL EVALUATION PROGRAM
Unknown, United Technologies Corp., Pratt & Whitney Aircraft Group, *P.O. Box 2691, West Palm Beach, Florida* 33402 (DF463710; F33615-79-C-2024)

The objective of this program is demonstrate the feasibility of using ceramic materials for cooled airfoil applications.

This will be a single phase, four task study to design and evaluate ceramics for cooled airfoil applications.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0006, UNIFIED SYNTHESIS OF MANUAL AND AUTOMATIC FLIGHT CONTROL
D.K. Schmidt, Purdue University, School of Aeronautics & Astronautics, *Life Sciences Bldg., West Lafayette, Indiana* 47907 (DF054350; AFOSR-79-0042)

AF function - given adequate design specifications, or aircraft handling qualities criteria, and a valid system model, synthesis techniques, particularly modern control approaches, are available to the system designer for synthesizing even the most

complex flight systems. Deficiency - weaknesses, however, exist in the handling qualities specifications for non-conventional aircraft such as control configured vehicles (CCV's), and for aircraft with significant structural dynamics needs. Objective - the objective is to synthesize vehicle augmentation to aid the pilot in the air-to-air tracking (gunnery) task. How research contributes-the proposed research would consist of the further development and application of a synthesis methodology usable in the absence of quantitative vehicle handling qualities specifications, and yet explicitly include design objectives based on pilot acceptance by means of an analytic pilot model.

The procedure involves the unique approach of simultaneously solving for the stability augmentation system (SAS) gains and pilot model via optimal control techniques.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

1.0007, HELMET MOUNTED OCULOMETER DEVELOPMENT

J. Merchant, Honeywell Inc., Radiation Center, *2 Forbes Rd., Lexington, Massachusetts* 02173 (DF142950; F33615-77-C-2077)

The mission this work unit supports is the simulation of advanced aerospace vehicles. The engineering flight simulator is a modern tool for the analysis and evaluation of current and future Air Force systems. The opportunity exists with simulations to develop proposed flight control system schemes including cockpit controls and displays. This requires man-in-the-loop participation throughout the design evaluation. The objective of this work unit is to develop, install, demonstrate and maintain a system capable of both head and eye measurements of the test subject without any attachments to the subject and within the framework of moving base simulation. This program contributes to effective simulation of flight vehicles.

Studies will be conducted to establish the optimum location for equipment to be installed. The equipment will then be engineered to be compatible with installation requirements. All power and signal cables will be installed and the equipment will be installed and demonstrated. The demonstration will consist of 3 hours reliable data acquisition daily for a period of two weeks with no more than 30 minutes downtime per eight-hour shift.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0008, DEVELOPMENT OF IMPROVED FATIGUE LIFE TRACKING SYSTEMS FOR NAVY AIRCRAFT

R.E. Pinckert, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DN081258; N62269-79-C-0225)

To develop improved fatigue life tracking systems for Navy aircraft in order to achieve significant improvements in the accuracy of fatigue-life-expended estimates of fleet aircraft. This contract will support work unit ZA-601, Aircraft Technology, Agency Accession DN 681080.

Program will be done in two phases. Phase I will be a conceptual design, analytical assessment and cost optimization of candiate tracking systems. Phase II will be a flight test and laboratory evaluation of the function and accuracy of the improved systems.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0009, FUEL CHARACTER EFFECTS ON CURRENT LOW PRESSURE RATIO CAN-TYPE AIRCRAFT TURBINE COMBUSTION SYSTEMS

C. Gleason, General Electric Co., *1 Jimson Rd., Cincinnati, Ohio* 45215 (DF460830; F33615-77-C-2042)

To determine the effects of fuel character changes on an existing low pressure ratio, can-type AF combustion system.

Single can combustor rig tests will be performed on a current AF combustion system such as the T56, J57, or J79. Fuel hydrogen content, types of aromatics, volatility, and fuel distillation end point are the parameters to be investigated. Close coordination with TBC will be maintained throughout this program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0010, TI/AL DESIGN/COST TRADE OFF ANALYSIS

D.O. Nash, General Electric Co., *1 Jimson Rd., Cincinnati, Ohio* 45215 (DF461680; F33615-77-C-2066)

The primary objective of this program is to evaluate suitable applications for titanium aluminide alloys in gas turbine engines. It shall be determined if these alloys offer a viable alternative to nickel base superalloys. Studies of static and dynamic components, fabricated from various manufacturing processes, will be conducted to discern all potential areas of application from a structural, economic, and life-cycle cost viewpoint.

A design/cost trade-off analysis of titanium aluminides in the wrought cast, forged, rolled and powder metallurgical states shall be made for both static and dynamic component applications. Finite element analyses shall be conducted to determine stress/strain distributions of the various component configurations with loadings and boundary conditions that are commensurate with the actual operating environments of the components. The critical areas of all components will be identified as well as the limiting material properties for that application. Potential methods of optimizing the limiting properties will be discussed plus an overall assessment of practically applying the materials to this type of component. In addition, the optimum applications for wrought material, cast, forged, rolled and powder metal forming shall be specified.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0011, THERMAL RESPONSE TURBINE SHROUD

Unknown, General Electric Co., *1 Jimson Rd., Cincinnati, Ohio* 45215 (DF463290; F33615-78-C-2071)

Analyze the effects of thermal response technology on engine performance and determine the level of complexity required to obtain maximum payoff with minimum cost.

Perform an analysis of thermal response effectiveness in relation to engine cycles and various other design parameters. Describe a number of concept alternatives for further consideration.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0012, THERMALLY CONTROLLED BOUNDARY LAYER TECHNOLOGY

J.D. Lee, Ohio State University, Columbus Campus, School of Engineering, Dept. of Aeronautical & Astronautical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF143230; F33615-79-C-3008)

The Air Force function for this effort is the design of future large aircraft, transports and bombers. The problem this effort addresses is the need to reduce the drag on these aircraft so that either the range can be extended or fuel required for a given mission reduced. The objective is to demonstrate the ability of cryogenic cooling of an airfoil surface to delay transition of the boundary layer and thereby reduce drag. The results of this study will contribute to the Air Force's fuel conservation effort.

This effort will first involve the design and construction of a simple low-cost wind tunnel model to demonstrate the effect of boundary layer cooling on an airfoil. This model will then be tested in a wind tunnel and the results used to verify or modify existing theory.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0013, APPLICATION OF COHERENT ANTI-STOKES RAMAN SCATTERING TO LASER & COMBUSTION MEDIA

B.R. Won, Systems Research Lab. Inc., *500 Woods Dr., Dayton, Ohio* 45432 (DF461250; F33615-77-C-2019)

Use coherent anti-Stokes Raman scattering (CARS) for measuring species concentrations and temperature as a function of position inside a jet engine combustor.

Use the CARS system already demonstrated to obtain spectra for organic compounds found in fuels and combustion products, use CARS to determine species concentrations vs position within a combustion system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0014, HYDRAULIC DYNAMIC ANALYSIS EXPERIMENTAL VERIFICATION

P.D. Lindquist, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF455370)

The purpose of this program will be to model the dynamic effects of an aircraft hydraulic system. Computer models will be developed and verified in the laboratory.

The approach will be to set up, beginning with a simple system, a hydraulic circuit in the laboratory and develop an analytic model which can be verified.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0015, FUELS TECHNICAL SUPPORT

C.R. Martel, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF464140)

Solve problems related to the use of aviation turbine and ramjet fuels in airbreathing propulsion systems. Provide support to operational systems and new systems under development.

Prepare and update fuel specifications as required. Aid in the investigation of field problems where needed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0016, VIBRATION TEST LEVEL CRITERIA FOR AIRCRAFT EQUIPMENT

P.S. Hall, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF143860)

The currently available methods for the formulation of vibration test criteria are not readily usable by all individuals associated with predicting the level and spectrum of vibration necessary for environmental and reliability testing of onboard equipments carried in modern high performance aircraft. Presently available vibration test level methods are either unrealistic, complicated for the non-vibration specialists, or require computer access and numerous input data. This work effort is to evaluate all existing vibration test level prediction methods, and construct criteria to determine vibration test levels to be used in MIL-STD-781, MIL-STD-810, or some other combined environment test specifications that are realistic, universally usable, and easily accessible.

Extract pertinent methodology from previous work unit efforts, contract studies, and military standards and specifications. Generate an analytical expression with proper validation through flight test data and other empirical data that results in an orderly and unified vibration test level prediction method.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0017, ADVANCED AIRBORNE DIFFUSERS

S. Hasinger, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF143660)

Airborne laser weapons systems depend on a high pressure recovery diffuser in order to discharge the laser exhaust gasses into the atmosphere. The effectiveness of the diffuser is crucial to the operation of these weapons systems. Present laser diffuser systems do not satisfy all the requirements established by AFWL, Kirkland A.F.B., N.M. It is the objective of this research to explore the potential of novel diffuser concepts for their eventual incorporation into an actual airborne laser weapon system. The general validity of these concepts has been proven in previous investigations at the AFFDL, Wright-Patterson A.F.B., Ohio. This research is conducted in direct coordination with AFWL, who is charged with the responsibility of developing various forms of airborne laser weapon systems.

Research will be carried out in the AFFDL Mach number six high Reynolds number wind tunnel on a single stage of the slanted cascade diffuser. The radial outflow diffuser will be tested in a Mach number two and three environment at a reynolds number of ten to the fifth power. In both cases the result will be a light, compact diffuser with a high pressure recovery and instant re-start capability. The slanted cascade diffuser is intended for use in the gas dynamic laser weapon system while the radial outflow diffuser is to be employed in the chemical laser system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, INTEGRATED FLIGHT PATH DISPLAY

C.J. Kopala, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF144340)

This work unit will support the design of advanced fighter aircraft cockpits. The flight path display to be designed will combine two current displays, VSD and HSD, onto a single display surface. In addition, it will provide the pilot with perspective and closure cues which have heretofore been unavailable. The objective of the work unit is to develop a three-dimensional pictorial flight path display, and to compare flight performance of A-7 pilots using this display with their flight performance using the current DAIS VSD and HSD CRTs. Their performances will be measured across a number of different flight maneuvers. The new flight path display will increase combat effectiveness by improving pilot navigation through highly dense threat areas.

An extensive review of all studies applicable to this program has been performed and documented in a report. The 3-D display proposed for development will incorporate those features of earlier 3-D models that were found to enhance flight performance. Objective flight performance data will be used to compare pilots use of the 3-D display versus their use of the current DAIS displays. Subjective data will also be taken from the pilots as they use each display set and the data used to compare the display sets.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0019, EVALUATION OF STRUCTURAL FASTENERS FOR INTEGRAL AIRCRAFT FUEL TANKS

J.D. Oetting, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF142870)

This work unit supports the requirement for enhanced fuel tightness in integral fuel tanks for USAF aircraft. MIL-A-8867B is directly supported in the area of fuel tank leak testing and MIL-T-5578 in the area of fuel tank sealing. This effort is directed toward solving the problems of fuel leakage at structural joints. The objective of this program is to screen various fastener systems and evaluate their ability to reduce fuel leaks. The reduction of fuel leak problems will significantly reduce the maintenance costs of USAF aircraft.

Candidate fastener systems will be obtained from vendors and installed in test coupons with recommended fuel sealants. Fuel pressurization chambers will be placed over the area of the fasteners while flight-by-flight loading is being applied to the test coupon. Fuel leak rates will be measured and compared with each candidate fastener system. Recommendations will be made for the procurement of the most qualified systems. The better rated fastener systems will be evaluated for fuel tightness with representative variations in hole preparation, hole size and fastener torque.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0020, INTEGRAL FUEL TANK TEST METHODS AND CRITERIA

M.D. Richardson, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF143150)

This effort will help to insure increased safety and more cost effective operation of future USAF aircraft. Current data retrieval systems have identified fuel leaks from aircraft integral fuel tanks as a high-cost item. These costs are incurred directly by the maintenance required to repair leaks and return the aircraft to flight status, and indirectly by the reduction in aircraft availability. The Air Force specification, MIL-S-8867, requires very little fuel tank testing and contractors do very little. The goal of this effort will be to develop a cost-effective method(s) of adequately certifying new aircraft with integral fuel tanks for fuel containment. As part of this goal a criteria defining adequate fuel containment will be established. The impact of effective test methods on such design parameters as cost, weight, materials and configuration can be significant. Accomplishment of this objective will permit economical and efficient operation of future USAF aircraft with respect to repairs necessitated by fuel system leaks.

Review current structural and dynamic test criteria. Determine scale and configuration of specimens needed. Develop test techniques to realistically simulate static and dynamic loads and related environments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0021, OH-58 COMPOSITE MAIN ROTOR BLADE PRELIMINARY DESIGN INVESTIGATION
R. Bragden, Bell Helicopter Textron, *Hwy. 183, P.O. Box 482, Fort Worth, Texas* 76101 (DA0E3798; DAAJ02-77-C-0073)

The OH-58 composite main rotor blade preliminary design investigation is a paper study to investigate the application of a composite main rotor blade to the OH-58 for replacement of its existing metal blade. The results from the program will be of significant benefit in establishing realistic requirements for a follow-on OH-58 product improvement program.

Each contract shall include two principal tasks. Task I shall include a trade-off of candidate blade concepts varying in design, configuration, method of fabrication and materials against design goals and objectives. The prime areas for consideration shall include ballistic survivability, radar reflectivity, R&M, life-cycle cost, and performance. From the trade-off analysis one concept shall be selected for Task II. Task II shall include in-depth preliminary design and analysis on the selected blade concept to optimize its characteristics. Each contractor shall be furnished technical reports on the OH-58. The program is now set up whereby the final reports shall be releasable to industry. Solicitation for the PIP program shall not be limited to the PD study contractors.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0022, NAVTOLAND (NAVY VERTICAL TAKEOFF AND LANDING) SYSTEM ERROR BUDGET
J. Wokkovitch, Vought Corp., *P.O. Box 5907, Dallas, Texas* 75222 (DN081105; N62269-78-C-0254)

To analyze and quantify the effects of landing guidance sensor noise, flight control sensor noise and environmental disturbances on V/STOL automatic approach and landing aboard small ships. The intent is to budget and identify disturbances that limit performance. This contract supports work unit ZA601, Agency Accession No DN681080.

Utilize non-linear covariance propagation analyses techniques to calculate autoland trajectory and touchdown error statistics.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0023, STRUCTURAL OPTIMIZATION METHODS
G. Sander, Universite de Liege, *7 Pl. du 20 Aout, Liege, Belgium* (DF143980; F33615-76-C-3145)

This effort supports the design and analysis of aerospace vehicle structures. The use of automated design methods for structural components contributes significantly to the effectiveness and efficiency of flight vehicles. The problem is to design the lightest weight and most efficient load carrying structure. The objective of this effort is to extend the development of the mixed method of structural optimization which retains the main advantages of the optimality criteria and mathematical programming approaches. This work will provide the basis for an analytical tool for minimum weight design of the structure thus improving the performance and cost effectiveness of the aerospace vehicle.

Determine the optimum value of the convergence control parameter, determine constraints that require exact linearization after each reanalysis and extend method to other types of constraints, i.e., dynamic, buckling, etc.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, ELASTIC AND INELASTIC ELECTRON-MOLECULE SCATTERING CROSS SECTIONS AND MOLECULAR PHOTOIONIZATION CROSS SECTIONS
V. McKoy, California Inst. of Technology, Graduate School, Dept. of Chemistry, *1201 E. California Blvd., Pasadena, California* 91109 (CHE76-05157 A02)

The principal objectives of the research are the development of theoretical approaches and practical computational schemes for calculating a) elastic and electronically inelastic cross sections for the scattering of low energy electrons by diatomic and polyatomic molecules and b) photoionization and photodetachment cross sections, including resonance contributions, for the ground and metastable states of molecules. The plan is to use two methods for calculating low-energy electron-molecule scattering cross sections which make use of discrete basis functions. The first method for calculating elastic and rotationally and electronically inelastic scattering of electrons by molecules involves the use of discrete basis functions. This feature has several important advantages for the electron-molecule scattering problem. The second method is a very simple and approximate procedure for computing cross sections for low-energy elastic electron scattering by diatomic and polyatomic molecules. Scattering information is extracted from a single diagonalization of the Hamiltonian in a discrete basis. The method for calculating photoionization cross sections completely avoids the need for obtaining molecular continuum eigenfunctions by taking advantage of certain analytic properties of the Hamiltonian expressions for these photoabsorption cross sections that can be evaluated using discrete square-integrable basis functions exclusively. This work is a continuation of that currently supported by Foundation grant CHE-7205038.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0002, STATE SELECTION AND STATE DETECTION OF MOLECULES WITH LASERS
R.N. Zare, Stanford University, School of Humanities & Sciences, Dept. of Chemistry, *Stanford, California* 94305 (CHE78-10019)

The objective of Dr. Zare's research program is to obtain state-specific (quantum) information on the dynamics of chemical reactions and of excited state formation and decay. This will be accomplished through the synthesis of molecular beam and of laser spectroscopic methods. Beam techniques permit the study of isolated molecules and the investigation of chemical reactions, one collision at a time. Laser techniques permit the preparation (state selection) of reagents and the interrogation (state detection) of the products. This quantum information will provide detailed state-to-state data that will answer these questions: How do chemical reactions occur? How do molecular scatter (desorb) from surfaces? How do photo-prepared molecules decompose or undergo other radiationless transitions?

This research represents a continuation of that currently supported by Foundation Grant CHE-7715938.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0003, INTERACTIONS AMONG EXCITED ELECTRONIC STATES IN ANIONS AND RELATED NEUTRAL MOLECULES

D.S. Tinti, University of California, Davis Campus, School of Letters & Science, Dept. of Chemistry, *Davis, California* 95616 (CHE77-11839 A01)

Dr. Tinti plans to investigate the interactions among the lower energy electronic states in closed-shell anions and related neutral molecules by low temperature optical spectroscopy in conjunction with ODMR (optically detected magnetic resonance) techniques. Covalent and ionic derivatives of oxalic acid will be examined to completely assign and characterize the lower energy electronic states in systems where several states of different orbital character are expected to occur in a narrow energy range. Thiocarbonyls, wherein the electronic states are widely separated, will be studied as examples of systems which violate Kasha's rule and to deduce the general consequences of thio-substitution on the excited state properties. The radiationless processes among excited electron states in the nitrite anion, which exhibits an uncommon excitation energy dependent total emission spectrum in a solid host, will be studied to determine the mechanisms and routes of electronic relaxation in a small molecule.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0004, GIANT INTRINSIC MAGNETIC HARDNESS

H. Oesterreicher, University of California, San Diego Campus, Inst. for Pure & Applied Physical Sciences, Dept. of Chemistry, *P.O. Box 109, La Jolla, California* 92037 (DMR76-10842 A02)

Recently materials have been identified in the Principal Investigator's laboratory and in Russia which exhibit the highest coercive forces ever measured; extrapolated values are in the megaoersted region. These materials are substituted rare earth (R) transition metal (T) compounds such as the series SmCo5-SmNi5. As outstanding values of coercive force are observed in single phase homogeneous bulk materials, this magnetic hardness is an intrinsic, fundamental solid state parameter. In fact, these materials appear to represent examples where the anisotropy field limits the coercive field. This study elucidates the physical and chemical origins of this effect; one expects to learn about a new mechanism leading to outstanding magnetic hardness. For this purpose anisotropy constants and coercive fields are measured, in part, in single crystals, as a function of temperature. Coercive fields are correlated with anisotropy fields and ordering temperature. The 'chemical' origins of the effect are elucidated by studying the effects of substitution for transition metals (T) in SmT5 or Sm2T7 and related compounds by elements which allow for a systematic change in spacial and electronic parameters. The relative contribution of T and R are established by working with compound series where either B or T is nonmagnetic. Giant intrinsic magnetic hardness will be sought in a wider range of compounds on the basis of R and T metals. In view of the outstanding strength of coercive forces part of this work shall be carred out in cooperation with the National Magnet Laboratory.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0005, SOLIDIFICATION OF METALLIC MELTS PRODUCED BY LASER IRRADIATION

S.M. Copley, University of Southern California, School of Engineering, Dept. of Materials Science, *3551 University Ave., Los Angeles, California* 90007 (DMR78-07532)

This is a continuation of a basic investigation on the solidification of metallic melts produced by laser irradiation. This program includes studies of: the processes that determine solute distribution; conditions under which the melt will solidify with the same orientation as the substrate; factors which influence the microstructure; and the magnitude of residual stress present in solidified layers. Experiments will be carried out on crystals of Ag-Cu, Ag-Ge and Au-Si. Surface compositions will be modified by plating or physical vapor deposition. The range of incident beam intensities and beam scan rates will be expanded over that previously used in irradiation treatments. The microstructures of irradiated specimens will be characterized by a variety of techniques including transmission electron microscopy, scanning electron microscopy, energy dispersive X-ray analysis, and electronprobe microanalysis. It is expected the results of this research will contribute to a basic understanding of solidification phenomena under far-from-equilibrium conditions, and to a better understanding of processes of possible technological importance, such as laser glazing and surface alloying. This is a continuation of research previously funded under NSF Grant DMR76-08897. This is the first year of a two year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0006, HETEROGENEOUS RECOMBINATION OF OXYGEN AND CARBON MONOXIDE ON SOLID CARBON DIOXIDE AND ITS IMPORTANCE IN MARTIAN AERONOMY

D.S. Sethi, University of Bridgeport, School of Arts & Sciences, Dept. of Chemistry, *285 Park Ave., Bridgeport, Connecticut* 06602 (ATM77-27217)

The objective of this research is to determine the importance of the heterogeneous recombination of CO and O on solid CO2, in the chemistry of the atmosphere of Mars. The Martian atmosphere consists largely of CO2, which can be photodissociated by solar ultraviolet radiation. Because known homogeneous recombination processes are slow, the mechanism by which CO and O recombine to form CO2 is of great interest in attempts to understand the known stability of CO2 in the Martian atmosphere. In this research, the rate of the reaction of CO and O in solid CO2 will be obtained as a function of temperature in the range 77 degrees to 150 degrees K, and the experiments will be done at concentrations typical of those encountered in the Martian atmosphere. The mechanism of the recombination process will also be studied. In addition to providing data of considerable interest in Martian atmospheric chemistry, the experiments will provide the basis for future studies of heterogeneous chemistry in the Earth's atmosphere.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

3.0007, PREPARATION AND PROPERTIES OF COMPLEX CARBIDES AND NITRIDES FOR ABRASIVES

H. Nowotny, University of Connecticut, Storrs Campus, School of Engineering, Dept. of Metallurgy, *Box U-37, Storrs, Connecticut* 06268 (DMR77-20504)

This research will be a study of the synthesis and evaluation of new ceramic abrasives based on complex carbides and nitrides. The objective will be to study the phase equilibria and crystal chemistry of wear-resistant materials such as titanium-aluminum-carbon and titanium-aluminum-nitrogen combinations. Synthesis of the carbides and nitrides will be done by sintering and hot pressing.

The research will include studies aimed at preparing cemented carbides, materials important to the areas of cutting, drilling and grinding. The wettability and reactivity of complex carbides and nitrides with binder materials such as copper and copper solid solutions will be investigated. Diffusion couples of the ceramics and metal will be annealed at high temperatures, and the diffusion will be measured as a function of time and temperature.

Characterization of the materials will include phase analysis by x-ray diffraction and the electron microprobe, optical and microscopy, and measurement of physical and mechanical properties, in particular hardness.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0008, DISORDERED SEMICONDUCTORS
H. Fritzsche, University of Chicago, School of Physical Sciences, Dept. of Chemistry, *5734 S. Ellis Ave., c/o Hinds Geophysics Lab., Chicago, Illinois* 60637 (DMR77-11683 A01)

The experimental program of research on the properties of defects and localized gap states in amorphous semiconductors previously supported by NSF grant DMR7515003 A01 will be continued. The role of valence alternation defects as luminescence or recombination centers will be studied by altering in a controlled manner their concentration by high-temperature doping and low-temperature drift diffusion of various addititves. Compensation of defects by the method of lithium drifting will be attempted in tetrahedrally coordinated semiconductors as well as in chalcogenide glasses. A new two-beam photoconductivity modulation technique using X-ray excitation together with infrared scanning will be employed to determine the energy distribution of recombination centers. Experiments will be performed to determine the nature of the reversible photostructural centers by means of photo-induced electron spin resonance and photo-induced infrared absorption.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0009, DELAYED FAILURE AND AGING OF MELT-SPRAYED CERAMIC-METAL BONDS IN PHYSIOLOGICAL MEDIA
S.D. Brown, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Ceramic Engineering, *207 Engineering Hall, Urbana, Illinois* 61801 (DMR78-18084)

This biomaterials project will deal with delayed failure and aging of ceramic-metal bonds in physiological media. The objective will be to understand the mechanisms which underlie these processes, both in vitro and in vivo. Attention will be focused on the measurement of subcritical crack velocity in plasma-sprayed alumina-coated-metal systems. The effects of the character of the coating-substrate system and the composition of the physiological media on subcritical flaw propagation, aging and delayed failure will be ascertained. Stainless steel and a titanium alloy will be used as substrate materials, and the physiological media to be employed for in vitro experiments will include deionized water and various isotonic saline solutions. The results will be examined in terms of a multibarrier kinetics model of the subcritical crack velocity. Biocompatibility tests will be made in conjunction with in vivo aging experiments. These will involve evaluation of local changes in tissues surrounding the implants by examination of histological sections.

This is a continuation of NSF Grant DMR76-03893.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0010, SUPERCOOLED LIQUIDS AND GLASSES
C.A. Angell, Purdue University, School of Science, Dept. of Chemistry, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR77-04318 A01)

A diversified program of laboratory and computer simulation experiments, bound together by a common concern with the metastable supercooled liquid state, is being continued. Highlighted are (1) Extensions of the study of supercooled and pressurized water into the very low temperature region (T less than minus 50 degrees C) accessible above 1 kbar applied pressure. Expectations include broadened density maxima occurring as low minus 80 degrees C and interesting pressure and temperature dependencies of the mass transport properties. Structural studies (near IR spectra) may show that water can exist as a mobile liquid in the absence of identifiable 'broken' hydrogen bonds. (2) Optical studies of local structure relaxation processes in glasses in and above their transformation regions for comparison with total system responses such as enthalpy and volume relaxations. These studies are intended to throw light on the origin of the broad 'distributions' of relaxation times characteristic of liquid relaxation processes at low temperatures. (3) Spectroscopic studies of the variation in the electronic state of anions (chloride or oxide) with composition through a Lewis acid-base equivalence point. (The result will aid interpretation of the composition dependence of redox processes in oxide glasses.) (4) The extended study by molecular dynamics computer simulations of liquid and configurationally arrested (glassy) states of simple ionic and molecular systems, through which correlations of thermodynamic and dynamic behavior with structural features may be obtained. This is a continuation of research supported under DMR73-02632.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0011, MATERIAL SUPPORT TECHNOLOGY - STRUCTURE OF INSULATING FILMS
R.L. Park, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (DN775707; N00014-77-C-0485)

Improvements in solid-state electron devices and development of new devices will require better understanding and control of the thin insulating films which are formed and deposited on the device surface. Many transistor devices used in Navy communications and surveillance systems use insulating films under device control electrodes or for surface passivation. Understanding and controlling the properties of the films is very important for future developments.

By analysis of the energies of electrons emitted from bulk solids following excitation of an atom by x rays it has been demonstrated that the local atomic structure around the atom can be deduced. Bombardment by fast electrons will excite atoms just as easily, except the electrons do not penetrate beyond a few atomic layers of the surface. The technique of extended appearance potential fine structure (EAPFS) has been developed to explore the properties of surface films, with the goal of deducing the local properties of a near surface atom excited by incident electrons. The emission of secondary electrons is influenced by the nearest neighbors thereby leading to data on local environments. These techniques are applied to insulators on silicon and III-V compound semiconductors. Correlation of structural and electrical properties of the films will be made.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0012, SOURCES AND DISTRIBUTION OF TRACE ELEMENTS IN THE ANTARCTIC ATMOSPHERE
W.H. Zoller, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Chemistry, *College Park, Maryland* 20742 (DPP76-23423 A01)

This is a continuation of NSF Grant Number DPP 7623423.

In this research project, the Principal Investigator seeks to identify and classify aerosols from different sources and to determine how these aerosols interact with and are removed from the Antarctic atmosphere.

Aerosols will be collected at the Clean Air Facility at the South Pole Station during the 1978 winter-over period and during the austral summer of 1978/79. The chemical composition of these aerosols will be determined. Their variation as a function of particle size and time will be investigated and these parameters will be related to the history of the air masses being sampled. The size distribution of the particulate material will also be determined, and the effect of ice crystals scavenging for the removal of the particulate material from the atmosphere will be investigated. Airborne studies using an instrumented LC-130 aircraft will be carried out to collect samples of atmospheric particulate material above and below the inversion layer over the Antarctic continent. Sampling of the volcanic emissions from Mt. Erebus will be attempted both from the crater rim and from the instrumented LC-130 aircraft.

Logistics support is required during austral summer of 1978/79 for two persons at South Pole station and for two persons on the instrumented LC-130.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Biological Behavioral & Social Sciences, Div. of Physiology Cellular & Molecular Biology

3.0013, DEFECT AGGREGATION IN IRRADIATED MATERIALS

K.C. Russell, Massachusetts Inst. of Technology, School of Engineering, Dept. of Metallurgy & Materials Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DMR77-23402)

This is a continuation of basic studies on phase stability and void formation in irradiated metallic materials. The theoretical work will employ the nodal line/critical point formalism of Poincare. A recently developed theory for phase stability under irradiation conditions will be generalized to include the effects of displacement cascade-induced dissolution and solute drag. A combined theoretical/experimental program on irradiation altered precipitation in Al-Ge and Al-Si will be continued. Numerical evaluation of the rate equations for precipitate nucleation under irradiation will be done at M.I.T., the experimental work at Harwell, England. A theory for homogeneous void nucleation is to be extended to heterogeneous nucleation at interphase boundaries and dislocations. Nucleation kinetics will be analyzed in terms of helium and vacancy trapping and defect energetics; expressions for the nucleation rate and terminal void number density will be derived. This is a renewal of NSF Grant DMR73-07609 A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0014, MOLECULAR COLLISIONS

J.L. Kinsey, Massachusetts Inst. of Technology, School of Science, Dept. of Chemistry, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (CHE78-09807)

In this reseach in the general area of quantum chemistry, Dr. Kinsey will investigate the properties of binary collisions between molecules or atoms. Such collisions represent the most elementary kind of chemical event, whether the outcome be transfer of energy from one molecule to another or rearrangements of bonds to form new chemical species. The primary aim of these studies will be to determine the details of energy utilization and disposal for such processes. Part of the work will focus on testing and extending a number of new techniques, developed in Dr. Kinsey's laboratory and elsewhere, for taking advantage of the properties of tuneable lasers to probe molecular collisions. A substantial effort will also be directed towards preparation of molecules with large, well-characterized amounts of vibrational excitation for investigating the effects of such excitation on the collisional and reactive properties of the molecules.

This research represents a continuation of part of the work currently supported by Foundation grant CHE-75-12852.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0015, THE STRUCTURE OF DISPERSED LYOTROPIC LIQUID CRYSTALLINE PHASES

S. Friberg, University of Missouri, Rolla Campus, School of Arts & Sciences, Dept. of Chemistry, *103 Parker Hall, Rolla, Missouri* 65401 (DMR76-23569 A01)

Lyotropic liquid crystals have been shown to have a pronounced influence on the stability of disperse systems such as emulsions and foams. The first report on this effect was published less than ten years ago, but the phenomenon has already been applied in technical developments within different areas, such as the pharmaceutical and food technology industries and for the dispersion of essential components in a variety of commodities, such as those used in the production of concrete and the application of paper coatings.

The objective of the program is a basic understanding of those factors that determine the adherence of a dispersed liquid crystal to an interface. The determinations include: (1) size distribution by optical and electron microscopy, viscosity, and light scattering; (2) the electric surface potential of dispersed, liquid crystalline particles by zeta-potential measurements; (3) comparison between the microscopic structure of the liquid crystal in bulk and in a dispersed state by low-angle X-ray diffraction and electron microscopy; and (4) interfacial tension measurements using the sessile drop method. Results from 3 and 4 are used to evaluate the influence of the anisotropic conditions at an interface on the geometric dimensions of the liquid crystalline structure. The evaluation is made from calculations of the Van der Waals pressure by using methods developed by Parsegian and collaborators. The results of these investigations will form the basis for establishing rules for the adherence of liquid crystals to interfaces. The application of these rules to technical problems within different industrial activities will take place in collaboration with the engineering departments and with industry.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0016, VIBRATIONAL-ELECTRONIC INTERACTIONS IN MOLECULAR SPECTRA

L. Goodman, Rutgers the State University of New Jersey, New Brunswick Campus, School of Chemistry, Dept. of Chemistry, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (CHE76-23813 A01)

Dr. Goodman intends to investigate the effect of molecular vibrations on electronic spectra of small and medium-sized molecules (4-25 atoms). He will pursue experimental and theoretical studies in two limiting cases, the non-dynamical weak coupling case where the Born-Oppenheimer approach is accurate, and the strong coupling case where the electronic motion is dependent on nuclear kinetic energy. The experiments will involve narrow line laser studies of band intensities and vibronic structure observed in excitation, absorption, and emission spectra for both free molecules in the vapor and in low-temperature (to 1.5 degrees K) solid environments. The two cases are found in molecules with well-separated and closely-spaced states, respectively. The theoretical studies will involve developing a method for handling the strong coupling problems with similar accuracy to the Born-Oppenheimer approach so that there is smooth passage between the non-dynamical and dynamical cases. Application to potential surface distortion, anomalous vibronic intensity and energy level perturbation effects is planned.

This research is a continuation of that currently supported under Foundation Grant, GP-31496X.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0017, INFLUENCE OF PLASTIC AND ELASTIC STRAINS ON STRENGTH AND FRACTURE OF MATERIALS AND ON ELECTRICAL PROPERTIES OF SEMICONDUCTORS

S. Weissmann, Rutgers the State University of New Jersey, New Brunswick Campus, School of Engineering, Dept. of Materials Engineering, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (DMR78-05930)

The project will be an x-ray topographic study of elastic and plastic deformation of semiconductor materials. The objectives will be to apply the topographic technique to determine: (a) the extent of microplastic zones in silicon induced by deformation and relaxation of plastic and elastic strains by subsequent annealing, and (b) the strains and defect structure in gallium arsenide metal-oxide-semiconductor (MOS) devices.

The experimental plastic zone measurements will be compared with predictions based on calculations of continuum mechanics. The x-ray diffraction topographic techniques will be augmented by transmission electron microscopy to examine the defect structure. The x-ray methods will include: imaging of plastic and elastic strain distribution by pendellosung fringe topography, precision measurements of lattice curvature by x-ray

scan with automatic Bragg angle control, assessment of the distribution of the defect structures in different crystallographic directions by the divergent beam method and rocking curve measurements, and magnitude of strain determination by quantitative intensity measurements.

This is a continuation of research initiated under NSF Grant DMR75-21763, is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0018, DEFECTS AND DEFECT MOBILITY IN IONIC CRYSTALS

A.S. Nowick, Columbia University, School of Engineering, Dept. of Metallurgy & Materials Science, *351 Engineering Ter., New York, New York* 10027 (DMR77-07141 A01)

Research on point defects in ionic crystals continues, employing measurements of ionic conductivity and relaxation phenomena. Of major interest is a study of diffusion of Li ion into MgF2 crystals, and the associated ionic conductivity, since Li ion has been found to be a fast diffusor in MgF2 (via interstitial migration). The discovery of a low-temperature internal friction peak due to Li2 pairs provides a useful auxiliary tool for this investigation. Previous studies utilizing both dielectric and anelastic relaxation in non-cubic crystals will be extended to the tetragonal crystal paratellurite (TeO2) containing appropriate dopants; this crystal will also allow a study of piezoelectric relaxation.

An investigation of protonic hydrogen (H ion) as a defect in ionic crystals is under way, with the initial investigation on NaNO3 and LiIO3 crystals. It is desired to introduce H ion and to determine its site occupancy, activation energy for migration, and interaction with other defects.

Finally, various extensions of the theory of relaxation phenomena continues.

This is a continuation of research supported under DMR 75-09603. First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0019, ESTABLISHMENT OF A HIGH ENERGY X-RAY SYNCHROTRON RADIATION LABORATORY

B.W. Batterman, Cornell University, Ithaca Campus, School of Engineering, Dept. of Materials Science, *242 Carpenter Hall, Ithaca, New York* 14853 (DMR78-01267)

The Cornell High Energy Synchrotron Source (CHESS) will utilize the synchrotron radiation generated in the Cornell Electron Storage Ring (CESR) for a variety of experiments requiring high energy x-rays. Synchrotron radiation is emitted by the relativistic electrons used in colliding beam experiments in CESR. The radiation is extremely intense with energy varying continuously from the x-ray region through the ultraviolet, is highly polarized, well focussed and is pulsed on a nanosecond time scale. CHESS will extend the photon energy range available in the United States from about 35 kev to more than 150 kev, thus making many significant experiments possible. Instruments will be developed to exploit this unique source of high energy radiation for experiments in areas such as atomic physics, chemistry, crystallography, metallurgy and condensed matter science. These facilities will be available to qualified scientists who need the high energy radiation not available elsewhere. CHESS will include facilities for 1) absorption and fluorescence spectroscopy at high photon energies; 2) diffraction and crystallographic studies; 3) non-conventional experiments such as Compton scattering, x-ray interferometry, nuclear resonant scattering and diffuse scattering.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0020, CRACK PROPAGATION IN PRE-CRACKED SPECIMENS OF ALPHA, ALPHA-BETA AND BETA TI-MN ALLOYS

H. Margolin, Polytechnic Inst. of New York, Brooklyn Campus, School of Science & Engineering, Dept. of Metallurgy, *333 Jay St., Brooklyn, New York* 11201 (DF054100; AFOSR-79-0028)

AF function - the longevity, reliability and safety of aerospace structures are related to the fatigue properties of the structural materials used. In fact, the fatigue properties of structural materials often limit their application. Opportunity - thus, it is important to understand the mechanisms of fatigue and especially the metallurgical means by which fatigue resistance may be improved. Systematic studies of fatigue crack initiation and propagation in alpha-beta titanium alloys are of great interest to the Air Force and would make useful contribution to future development of engineering alloys. Objective -this research will determine the relationship between fatigue properties and microstructures of two-phase (alpha-beta) titanium alloys. Specifically, the Ti-Mn system will be used as a model system for alloys consisting of two ductile phases. How work contributes - alloy composition and heat treatment can be used to vary the volume fraction and morphology of the phases present, and thus, by this study, the most desired microstructures for fatigue resistance can be determined.

Fatigue crack initiation and propagation characteristics will be related to microstructural features such as phases present, particle size and distribution, and dislocation densities. Monotonic and cyclic stress-strain curves will be determined for each alloy composition to aid in interpretation of fatigue data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0021, HIGH-TEMPERATURE PLASTIC FLOW IN A15 SUPERCONDUCTING COMPOUNDS

R.N. Wright, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Materials Engineering, *110 8th St., Troy, New York* 12181 (DMR78-05726)

This is a continuation of research on the high-temperature plastic deformation of A15 superconducting compounds. Continued use will be made of hot isostatic pressing to produce low-porosity materials with maximal A15 matrix phase content. The effects of refined grain size on stress-strain rate-temperature (S-SR-T) response will be evaluated through study of Zr-doped Nb3Sn. A refined grain size should facilitate plastic deformation by abetting diffusional flow deformation mechanisms, and is required to achieve enhanced critical current values. The effects of variations from stoichiometry on S-SR-T response will be studied on a range of V3Ga specimens. Thorough microstructural characterization will be undertaken. Mechanical behavior will be evaluated through the use of deformation mechanism mapping techniques, in an effort to identify micromechanism of deformation, and to provide a basis for comparison with other materials. Critical temperature, critical current and low-temperature heat capacity measurements will be undertaken, and the results obtained correlated with microstructural observations and mechanical behavior in order to assess the effect of high-temperature deformation on superconducting properties. A detailed consideration of dislocation geometry and motion in A15 compounds will be done using electron transmission microscopy. An evaluation of the influence of hydrostatic pressure on high-temperature Nb3Sn fracture behavior will be performed using constrained plastic flow testing analogous to direct extrusion. The results of this study are expected to serve as a scientific basis from which it may be possible to control deformation processing parameters in order to achieve acceptable superconducting properties in A15 and related superconducting materials. This is a continuation of research, previously funded under NSF Grant DMR76-00554. This is the first year of a three year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0022, STARK SPECTROSCOPY OF MOLECULAR SOLIDS

D.M. Manson, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Chemistry, *Stony Brook, New York* 11790 (CHE78-06606)

Effects of external electric fields on electronic spectra of pure and doped molecular crystals, glasses, liquids, and vapors are to be used to locate and characterize charge transfer exciton states in crystals, to characterize the charge distribution in excited vibronic states of molecules, and to probe the microscopic electric field in anisotropic molecular systems. In the experiments, standard methods of high resolution optical spectroscopy are combined with modern techniques of laser excitation and computerized data acquisition and analysis. Supersonic molecular beams may be utilized, and the feasibility of using x-ray diffraction in the presence of an intense optical radiation field to probe the microscopic electric field is to be examined. The experiments will determine the energy of charge transfer exciton states, the validity of the Wannier or Frenkel ion-pair exciton models, the parameters of electron-phonon and exciton-exciton coupling, and the structure of the charge-transfer exciton band, and will document the variation of these properties with chemical composition and crystal structure. The excited vibronic state charge distributions will be characterized by measurements of the dipole moment parameter. The relationship between the macroscopic dielectric properties of molecules in condensed phases and the microscopic characteristics of the molecules is to be derived for various theoretical models, and data are to be obtained to test the validity or applicability of these results to specific real systems.

This research represents a continuation of that currently supported by Foundation Grant CHE-7509680.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0023, DEVELOPMENT AND TESTING OF A QUANTITATIVE INFRARED REMOTE SENSING METHOD

P.R. Griffiths, Ohio University, Athens Campus, School of Arts & Sciences, Dept. of Chemistry, *Athens, Ohio* 45701 (CHE77-01058 A01)

Dr. Griffiths is developing a method for the remote quantitative analysis of hot gases by infrared emission spectroscopy using a mid-infrared Fourier transform spectrometer. Computer programs have been written using which the temperature and composition of hot gases containing either Co or CO2 can be calculated assuming the variation of the width of each rotational line in the vibration-rotation spectrum with temperature is accurately known. These line-widths, both self-broadened and air-broadened, are being measured using a tunable diode laser spectrometer. It has also been found that current phase correction algorithms for interferograms measured using rapid-scanning Fourier transform spectrometers do not allow discrete work, and methods for improving this algorithm are being developed. All techniques are being tested using spectra measured both in the laboratory and in the field. The spectra obtained in the field are from stationary sources of pollution such as coal burning power plants, blast furnaces and turbines.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0024, ELECTROCHEMICAL IMPREGNATION FOR THE FABRICATION OF CADMIUM ELECTRODES

Y. Kao, University of Cincinnati, School of Engineering, Dept. of Chemical & Nuclear Engineering, *101 Baldwin Hall, Cincinnati, Ohio* 45221 (DF054990; AFOSR-79-0104)

AF function - communications, flight operations, life-support systems depend on auxiliary battery sources for power. Deficiency -there is a continuous need to attain longer life, higher energy, lighter weight batteries to meet power requirements. Objective - to further the understanding of the kinetic process of electrochemical impregnation. How work contributes - this research will further the electrochemical method in achieving higher loading and utilization of the active cadmium electrode.

A cyclic voltammetric technique has been used in a helium atmosphere to study the cathodic deposition of cadmium on nickel. A unique reduction reaction occurs on the nickel electrode in the presence of the cadmium ion. It appears to be the electrodeposition of cadmium oxide which passivates the electrode surface. This may not be desirable. To improve the deposition process a potential controlled current program is to be carried out in which cadmium hydroxide is deposited at high current densities followed by conversion to fresh cadmium at lower current densities. The electrode is then subject to charge-discharge studies in alkaline solution to examine its behavior. Most electrodeposition processes are conducted at near boiling temperature of the solution. A study will be done on the temperature effect in the loading of cadmium electrode. The potential programmed deposition technique will be applied to porous electrode (which is the common form of the cadmium electrode) and its performance be determined. Preliminary modelling studies will be carried out if experimental results justify it.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0025, MECHANISMS OF ORDERING IN SOME NI-BASED BINARY ALLOYS

D.E. Laughlin, Carnegie Mellon University, Inst. of Technology, Dept. of Metallurgy & Materials Science, *Frew Ave. & Margaret Morrison, Pittsburgh, Pennsylvania* 15213 (DMR78-05723)

This is a study of several mechanisms to determine how a single phase solid solution decomposes into two phases, one of which is ordered. Ordering reactions will be investigated in several nickel-based binary alloys (Ni-V, Ni-Be, Ni-Mo and Ni-Ti) using transmission electron microscopy (TEM) and differential scanning calorimetry (OSC). The TEM studies will document the transformation microstructures, and the OSC studies will characterize important thermodynamic and kinetic parameters. Of special interest is an analysis of continuous transformations in these alloys. In an earlier phase of this study, the spinodal ordering reaction in the Ni-Mo system was investigated, using TEM. The DSC experiments will provide additional information on the temperature ranges of instability. The results obtained will be used to assess solid solution thermodynamic models for alloys which exhibit continuous transformations. Concomitantly, some important mechanical properties (including yield strength, tensile strength, work hardening coefficient and fracture mode) will be measured systematically for specimens which have undergone different modes of transformation. It is expected the results of this investigation will provide a better understanding of precipitation of ordered phases in solid solutions, and serve as a basis for the development of advanced theoretical models to describe clustering and ordering in metallic solid solutions. This research was previously supported under NSF Grant DMR76-22353. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0026, THEORY OF NONLINEAR OPTICAL SUSCEPTIBILITIES

H.F. Hameka, University of Pennsylvania, School of Arts & Sciences, Dept. of Chemistry, *34th & Spruce Sts., Philadelphia, Pennsylvania* 19104 (CHE77-22638)

In present and future lightwave communication systems there is an urgent need for a number of devices such as modulators, amplifiers, couplers, etc., which are capable of processing high intensity light beams. The operation of such devices depends on certain nonlinear optical and electrooptical effects. Professor Hameka will calculate various linear and nonlinear electric susceptibilities that represent the magnitudes of these nonlinear optical effects. In particular he will develop theories that relate the magnitudes of these susceptibility terms to chemical structure. Such calculations should lead to the identification of materials that have unusally large nonlinear electric susceptibilities. Particular attention will be paid to conjugated and aromatic molecules and to unsaturated polymers.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0027, PHOTOELECTRON SPECTROSCOPY OF TRANSITION METAL CARBONYLS

M.B. Hall, Texas A & M University, College Station Campus, School of Science, Dept. of Chemistry, *College Station, Texas* 77843 (A-648)

The ESCA spectra of (h5-C5H5Fe (CO))2-micron-Ph2P-(CH2)nPPh2m ion, (n equals 1, 2), (m equals 0, 1) have been measured and compared to the results of parameter-free Fenske-Hall molecular orbital calculations. The calculations are used both to calculate ESCA satellite intentions via the sudden approximation and to describe the valence electronic structure. The results of the sudden approximation, which predict no satellites of intensity greater than 10 percent of the main peak, are in good agreement with the ESCA spectra, where no satellites are discernable. However, using the same theoretical results, we find that the Hush model predicts a single intense satellite, which is in disagreement with the full MO sudden approximation and the ESCA spectra. The description of the valence electronic structre is in good agreement with previous results for the cyclic voltammetry, for the carbonyl stretching frequencies, and for the crystal structures. However, they suggest that oxidation of the neutral species involves removal of an Fe-Fe nonbonding electron, rather than removal of an electron from the Fe-Fe sigma bond.

SUPPORTED BY Robert A. Welch Foundation

3.0028, MOLECULAR SPECTROSCOPY AND MOLECULAR QUANTUM MECHANICS

R.M. Hedges, Texas A & M University, College Station Campus, School of Science, Dept. of Chemistry, *College Station, Texas* 77843 (A-106)

Work has continued on the investigation of excited electronic states of aromatic hydrocarbons by study of N2 pulsed laser excited fluorescence and the fluorescence decay of individual vibronic lines.

A reexamination of the fluorescence of coronene shows that its fluorescence is the S0 yields S1 emission. The half-lives of some twenty of the more prominent fluorescence lines of coronene from 4200A to 5070 were measured in n-alkane solvents at 77 degrees K and room temperature. At room temperature all lines have lifetimes of 225 plus or minus 5ns. At 77 degrees K all lines have lifetimes of 220 5ns and the 4200A line has a lifetime of 20 plus or minus 2ns. The 4200A line is interpreted to be emitted from an unrelaxed excited vibrational level of S1, a 'hot fluorescence'.

The quantum yield of S0 yields S2 is apparently too small for us to observe it under our experimental conditions. The S0 yields S2 emission should occur in a region in which there occurs some N2 fluorescence (noise from our laser source). This N2 fluorescence has caused us some bad moments.

We have observed the fluorescence spectrum of 1,12-benzperylene in n-heptane at 77 degrees K and measured the decay of many individual vibronic lines. Our analysis supports the assignment of the shortest wavelength line (highest energy) as a 'hot fluorescence' from S1 rather than an emission from S2.

SUPPORTED BY Robert A. Welch Foundation

3.0029, NEW EXPERIMENTS IN PULSED NUCLEAR MAGNETIC RESONANCE

C.G. Wade, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Chemistry, *200 W. 21st St., Austin, Texas* 78712 (F-370)

Pulsed nuclear magnetic resonance techniques have been used to study molecular dynamics in model membrane multilayers and in liquid crystals. The lateral diffusion coefficient of phospholipid molecules in oriented phospholipid/D2O model membranes has been measured using pulsed NMR spin echo techniqes. Oriented samples are used to minimize anisotropic dipolar interactions. Diffusion coefficients over a temperature range 28-70 degrees C were measured for the following lecithins: dipalmitoyl, dilauryl, dimyristoyl, and egg yolk. The diffusion coefficients are in the range 10 to the minus 7th power to 10 to the minus 8th power sq. cm/sec. The hydration dependence of lipid diffusion for dipalmitoyl was determined. The addition of cholesterol decreases diffusion. Calculations have been done which improve the accuracy of the D measurements; this approach includes the effects of image currents in the pole pieces for the usual orientation of the quadrupolar gradient coils. The theory of NMR relaxation in liquid crystals has been extended to include internal rotations and the axial symmetry of the molecules. The results have been quantitatively applied to proton, carbon-13, and deuteron relaxation data in liquid crystals.

SUPPORTED BY Robert A. Welch Foundation

3.0030, DEFECT INTERACTIONS IN METALS

R.A. Johnson, University of Virginia, School of Engineering & Applied Science, Dept. of Materials Science, *Garrett Hall, Charlottesville, Virginia* 22903 (DMR78-07539)

This is a continuation of a study of the kinetics associated with the interactions between defects in irradiated metallic materials, using computer modeling techniques. A mathematical model has been developed to study nucleation of point defect clusters in solids, and applied to the case of homogeneous nucleation of interstitial clusters under uniform irradiation conditions. The current research is aimed at studying the subsequent vacancy cluster nucleation and at understanding the effects of trapping and of non-uniform defect production both spatially and in time. The effect of elastic point defect/dislocation interactions on point defect kinetics near dislocations will be investigated to determine the role of dislocations as sinks for point defects, and as nucleation sites for defect clustering. An interatomic potential has been developed for titanium, a hexagonal close packed metal. A collaborative effort is underway with Professor J. Beeler at North Carolina State University to better understand the primary defect parameters for interstitials and vacancies in titanium. This research was previously funded under NSF Grant DMR75-22462A01. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0031, INVESTIGATION OF STRUCTURAL, MAGNETIC, & SPECTROSCOPIC PROPERTIES OF POLYNUCLEAR & ONE- & TWO-DIMENSIONAL TRANSITION METAL HALIDE COMPLEXES

R.D. Willett, Washington State University, School of Arts & Sciences, Dept. of Chemistry, *Administration Bldg., Room 101, Pullman, Washington* 99163 (CHE77-08610 A01)

The research involves the synthesis and characterization of a number of magnetic materials of low dimensionality. The purpose is two-fold: to study structural-magnetic relationships and to provide experimental systems with which to test predictions of models for magnetic interactions. The major initial efforts will be centered on the two-dimensional canted antiferromagnetic (RNH3)2FeCl4 and (RNH3)2NiCl4 salts, on two-dimensional antiferromagnetic (RNH3)2CoCl4 salts, and on the one-dimensional XY antiferromagnetic ((CH3)3NH)3CdCoCl7 systems. Other systems under study include potential ferromagnetic spin 1/2 linear chain systems and catalytic cluster systems. The principal techniques which are utilized are single crystal X-ray diffraction studies, mutual inductance magnetic susceptibility and magnetic moment measurements, EPR linewidth studies, and fluorescent lifetime studies.

This project is a continuation of CHE74-23207-A04.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Chemistry

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, SUPPORT SERVICES FOR USERS OF THE CHATANIKA INCOHERENT SCATTER RADAR DURING THE IMS PERIOD

R.D. Hunsucker, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM77-21460)

This grant funds Geophysical Institute personnel to provide operation, maintenance data collection, and some data reduction for instrumentation used in support of Chatanika incoherent scatter radar operations by users other than the University of Alaska during the IMS. The Geophysical Institute will endeavor to obtain good quality data, prepare copies of the data, and disseminate the data to Chatanika radar users by specific request. It will also provide technical assistance in operation of other support instrumentation provided by radar experimenters, as well as limited assistance in Chatanika radar operations. This will lead to a more fruitful net IMS effort than would be otherwise possible.

The Chatanika incoherent scatter radar near College Alaska provides a unique set of high-latitude time continuous profiles of charged particle temperatures and concentrations, neutral winds, electric fields and energy deposition rates: parameters leading to better understanding of upper atmospheric physical processes. Research scientists from over a dozen U.S. and foreign institutions travel to Chatanika each year to pursue their research efforts, and this pressure is enhanced during the present years of the International Magnetospheric Study. The efforts by the PI supported by this grant provide a more meaningful context of geophysical data within which this overall effort will now take place.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

4.0002, FULL GROWTH AUXILIARY POWER SYSTEM

F. Suriano, Garrett Corp., *402 S. 36th St., Phoenix, Arizona* 85034 (DF451280; F33615-75-C-2016)

The program objective is to develop advanced technology components for the auxiliary power unit (APU) resulting from contracts F33615-69-C-1100 and F33615-72-C-1936. As a goal, these components shall make possible an APU capable of 165 shaft horsepower, 150 hp/cu. ft and 1.65 hp/lb at 130 degrees F sea level static conditions. The program shall emphasize APU hot end component development.

The intent of this effort encompasses APU redesign, utilizing the basic APU configuration developed under contract F33615-72-C-1936 as the baseline, including hot end components development, as required to accomplish the stated objectives. To minimize program cost, a demonstrator APU shall not be developed. The program shall consist of the following two phases- (1) APU design - provide an APU conceptual design, design in detail hot end components to be developed, and define a detailed test plan and (2) component development - develop APU hot end components required to achieve program goals. During conceptual design, the baseline compressor is considered to be that configuration developed under contract F33615-72-C-1936. Adjustments of compressor mass flow and pressure ratio, attainable by minor changes in parameters such as speed, inlet guide vane (IGV) settings, or shroud contour of the baseline compressor stages, are permitted to achieve overall program goals. A critical design review shall be held at design phase completion.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0003, DESIGN-FOR-REPAIR CONCEPT DEFINITION

R.G. Palomba, Hughes Aircraft Co., *Centinela Ave. & Teale St., Culver City, California* 90230 (DF111320; F33615-78-C-1461)

To investigate the capability for self-sufficient avionic systems with no external support equipment and elimination of the intermediate level of repair for modules.

The approach is to review automatic test/fault isolation techniques currently used, consider preflight, inflight, postflight test/fault isolation, module replacement, recertification, assess technologies which may impact current maintenance concepts such as built-in-testing, adaptive modules, fault tolerance, partitioning, standardization and packaging, define design features required for implementation of appropriate technologies, identify gaps in current technology which must be filled to permit implementation of desirable advanced maintenance concepts, develop a detailed plan for follow-on efforts to enhance avionics maintainability if new concepts prove promising.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0004, COMMUNICATIONS - LOW ENERGY PARTICLE EXPERIMENT

R.D. Sharp, Lockheed Missiles & Space Co. Inc., Lockheed Palo Alto Research Lab, *3251 Hanover St., Palo Alto, California* 94304 (DN223316; N00014-78-C-0479)

Ionospheric disturbances associated with geomagnetic substorms and particle precipitation degrade the performance of naval communication, navigation, and surveillance systems. This program is investigating the mechanism directly responsible for auroral precipitation, as well as the fundamental properties of ionospheric-magnetospheric coupling and its possible role in triggering substorms.

Measurements of ion mass, energy, and pitch angle distribution made by the ONR 118 experiment on the S3-3 satellite are used to investigate the physical mechanisms responsible for acceleration of the upstreaming ions that inflate the ring current and for energetic particle precipitation into the ionosphere.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0005, PERTURBATION METHODS IN TRANSONIC FLOW

D. Nixon, Nielsen Engineering & Research Inc., *510 Clyde Ave., Mountain View, California* 94043 (DF054770; F49620-79-C-0054)

AF function - advanced aerospace vehicles. Deficiency - a need exists for rapid and accurate design and analysis computational methods for transonic flows. Objective - to develop a computationally inexpensive method to obtain a range of nearly transonic two- and three-dimensional solutions based on standard solutions obtained with existing transonic codes. How work contributes - a fast, economical method will be provided which is suitable for use in finding the influence of changes in geometric and flow field parameters (preliminary design application) or to correct solutions obtained either on coarse computational grids or by satisfying lower order approximations of the governing conservation equations. Both areas of application of the method address the deficiency indicated above.

A transonic perturbation theory which allows a range of transonic flow solutions to be found by simple algebra provided that a base solution and a calibration solution are known will be investigated. The applicability of the method will be determined for correcting transonic solutions obtained on coarse computational grids based on particular fine grid solutions as well as for correcting Euler or small perturbation solutions for viscous effects based on particular Navier-Stokes solutions. The method will be extended both for physical perturbation problems in unsteady transonic flows and, if possible, for Navier-Stokes solutions in which separated regions occur.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0006, LABORATORY EXPERIMENTS ON SPACE PLASMAS

F.W. Crawford, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (ATM78-08440)

This grant will support experimental and theoretical research aimed at three basic plasma physics problems, all of which have special significance to space plasma phenomena: First, a primarily laboratory study by spectral methods of the influence of collisions on the excitation and saturation characteristics of ion acoustic waves in a collisionless to moderately collisional plasma; next, extensions to realistic antenna geometry and warm plasma effects of the theory of ionospheric pulse propagation, with the aim of utilizing the results for planning a satellite

experiment; and finally, an experimental study of double-sheaths, with an emphasis on the magnetic field effects.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

4.0007, AN INTERNATIONAL MAGNETOSPHERIC STUDY (IMS) ANTARCTIC VLF DIRECTION-FINDER NETWORK

R.A. Helliwell, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (ATM75-15852 A02)

As part of the International Magnetospheric Study (IMS), this grant will support establishment of a VLF direction finder near Siple Station in the Antarctic and the operation of a direction finder near Roberval, Canada, conjugate to the Siple, Antarctica, VLF transmitter. The purpose of the network will be to locate and track the field-aligned ducts along which whistlers and VLF noise propagate through the ionosphere and magnetosphere to ground stations. This information will be used to define the structure and convection patterns of the magnetospheric plasma. It will also be used to study VLF wave-particle interactions, including the mechanisms of wave growth and precipitation of energetic particles. The direction finders will be located at the Antarctic stations Siple (USA) and Argentine Islands (UK), and at Roberval, Canada. They will be part of an international four-station network in the Antarctic, which will include direction finders at Halley Bay (UK) and General Belgrano (Argentina and France). Cooperating groups are expected to operate direction finders at the higher latitude of Syowa Base (Japan) and will operate conventional broadband VLF receiving systems at other locations in both hemispheres.

The cooperative aspects of this work will make it an important part of the VLF studies to be continued during IMS.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

4.0008, VERY-LOW-FREQUENCY PROBING OF THE MAGNETOSPHERE FROM SIPLE STATION, ANTARCTICA

R.A. Helliwell, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (DPP76-82646 A01)

This is a continuation of NSF Grant DPP7682646. This program will involve initial winter-over operations at Siple Station, Antarctica, including tests and coordinated use of a variety of experimental equipments. Major efforts will be devoted to initial operations of the Jupiter VLF transmitter, a new system which includes previously unavailable amplitude modulation of the radiated signal. Jupiter is essentially a high-gain audio amplifier. At low power, it can operate broadband over the range 1-30kHz, instead of within the 1 kHz steps of the present system. Transmitter operations will include further investigation of the magnetospheric response to changes in transmitter power and initial studies of the response of the magnetosphere to transmission at multiple frequencies. A major objective will be continued studies of wave-induced particle precipitation so as to better determine how the observed types of precipitation events contribute on a large scale to a loss of energetic particles from the magnetosphere. An improved monitoring system will be available for handling and displaying photometric and VLF wave information on precipitation activity. Passive VLF studied of magnetospheric thermal plasma particle dynamics will continue as part of international cooperative observing campaigns, and as a source of information on magnetospheric parameters for active probing experiments. Special VLF transmissions to satellites will continue as part of in situ studies of the details of magnetospheric wave-particle interactions. In the 1979-80 summer season, active and passive VLF probing will be carried out at Siple in support of a special rocket-balloon campaign to study wave-induced particle precipitation effects in the ionosphere and subionosphere. Logistics support is required for both summer and winter-over operations at Siple Station.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Polar Programs

4.0009, FABRICATION TECHNIQUES AND SEMICONDUCTOR LASER DEVICE RESEARCH FOR USE IN GUIDED WAVE OPTICAL COMMUNICATION

S. Wang, University of California, Berkeley Campus, School of Engineering, Dept. of Electrical & Computer Engineering, *Berkeley, California* 94720 (ENG76-08292 A01)

A program of research to study semiconductor lasers and laser performance for guided wave optical communications will be conducted. Continued work on new laser and waveguiding structures suitable for integrated optics and application of surface chemistry for improving and innovating device-fabrication technology will be pursued. Laser physics for understanding the operation and improving the performance of semiconductor lasers under high injection-current and high laser-power densities will be investigated. Specific laser structures that will be studied are: (1) the Distributed Bragg Reflector (DBR) injection laser with separate optical and carrier confinement, which promises single-mode operation with sufficient output power and can easily be integrated with other optical devices, and (2) the inverted-ridge waveguide (IRW) laser with current confinement for control of lateral modes, which opens the possibility of direct waveguide-fiber coupling. In the area of device fabrication, the role of surface energy and chemical bonding will be examined for possible new laser and waveguiding structures. In the area of laser physics, the effects of high injected carrier concentrations and high laser fields on the index of refraction will be explored along with the gain constant of the active region of the laser.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Engineering & Applied
Science

4.0010, FUNDAMENTAL INVESTIGATION OF SUPERPLASTIC FORMING PROCESS

A.K. Mukherjee, University of California, Davis Campus, School of Engineering, Dept. of Mechanical Engineering, *Davis, California* 95616 (DF054640; AFOSR-79-0069)

AF function - superplastic forming operations have found extensive use in the fabrication of airframes (monolithic, integrally-stiffened structures), and in the manufacture of gas turbine engines components using the newer generation superalloys. Opportunity - coupled with diffusion bonding, the superplastic forming-diffusing bonding operation has allowed manufacturing engineers a more cost effective design with significant savings in materials costs, labor-intensive machining costs, and the possibility of obtaining large geometrically complicated shapes in one step. Objective - this research will clarify the mechanical and microstructural properties of structural alloys in superplasticity and creep processes. How work contributes - a better understanding of the dependence of superplastic strain rate on temperature, flow stress, grainsize and other microstructural details will be of significant help in optimization of processing variables. Such optimization will enable the material to be deformed at the highest possible forming rates and still benefit from the remarkably large ductility associated with superplasticity.

Four areas are proposed for special study: 1) consideration of microstructural modifications induced by superplastic flow and their effect on the mechanical properties of the superplastically deformed material, 2) investigation of the nature of stress-strain data, activation energy, and threshold stress in low strain rate regions which correspond to the creep strain rates usually encountered in service of high temperature components, i.e., gas turbine engines, 3) delineation of ranges of operation of superplastic processes, and study of the criteria for the transition from superplasticity to creep. In addition, investigation of the factors that would allow extension to higher strain rates and optimization of the processing parameters for forming operations, 4) determination of the factors which lead to fracture during the

superplastic process in terms of microstructural modification, cavitation and geometrical instability. During the first year, the areas outlined above will be investigated using a well charactorized model system (Al-Zn eutectoid alloy). Subsequent effort will focus upon alloys with potentially important applications in the manufacture of airframes and engines (such as Ti-6Al-4V, a near-beta Ti alloy, In-100, and a high strength aluminum alloy).

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0011, MOLECULAR BEAM STUDIES OF SURFACE STRUCTURE, SURFACE PHONON EXCITATIONS, AND THE DYNAMICS OF GAS-SURFACE INTERACTIONS

D.R. Miller, University of California, San Diego Campus, Graduate School, Dept. of Applied Mechanics & Engineering Sciences, *P.O. Box 109, La Jolla, California* 92037 (DMR78-17176)

Experimental and theoretical studies of low energy molecular beam scattering from solid surfaces previously supported by NSF grant DMR-7623009 will be continued. These studies include: (1) atomic beam spectroscopy of surface structure and phonon excitation, and (2) internal energy exchange in the scattering of polyatomics from surfaces. Experimental studies will be conducted in an ultra high vacuum molecular beam facility using both time-of-flight and fluorescence spectroscopy to measure translational and internal energy of scattered or desorbed species. Theoretical treatments will be quantum mechanical, utilizing several types of approximations: extended distorted wave Born, Rayleigh scattering, and impulsive approximations. The effects of attractive gas-surface potential and bound state resonances on both elastic and inelastic scattering will be examined. The surface spectroscopy will utilize low energy helium atom scattering. Inelastic studies will initially involve the simple diatomics H2, D2, N2. The internal rotational state of N2 will be examined spectroscopically. Surfaces to be investigated initially are Ag(111), W(100), and LiF(100). The scattering of molecular beams from solid surfaces provide a sensitive probe of surface structures, excitations and interactions with adsorbed atoms or molecules. The objective of this research is to develop an improved understanding of these processes as they affect the physics and chemistry of surfaces.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

4.0012, MULTIMODE OPTICAL SWITCHING AND BEAM EXPANSION

E. Garmire, University of Southern California, School of Engineering, Dept. of Electrical Engineering, *3551 University Ave., Los Angeles, California* 90007 (DF903760; F19628-77-C-0221)

AF function - command and control. Deficiency/opportunity -communications links lack security and are inefficient. Objective - to develop integrated optic laser source optimally suited for coupling to optical fiber. How research contributes - provides improved source for optical communication links.

Integrated optics will be used to render the output of a CW GaAs double-heterostructure, stripe-geometry laser compatible with coupling to optical fibers. A distributed Bragg reflector will be used to achieve spectrally narrow output. A 100 micrometer-square beam will be produced by waveguide beam-expansion techniques for butt-coupling to a multimode optical fiber. First, the beam will be expanded in the plane of the waveguide by using a 90-degree grating beam expander. A grating output coupler will be used to produce a laser output normal to the waveguide surface having the desired near-field spot size and pattern. The effects of blazing the gratings on output coupling will be studied. Applications of waveguide beam expansion to optical signal processing will also be investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0013, ELECTROMAGNETIC SCATTERING PROCESSES AT RESONANCE AND WITH INTENSE FIELDS

R.W. Hellwarth, University of Southern California, School of Engineering, Dept. of Electrical Engineering, *3551 University Ave., Los Angeles, California* 90007 (DF054890; AFOSR-79-0098)

AF function - there is a critical need to find means to eliminate deleterious effects of phase distortion of laser beams being considered for weaponry, reconnaissance and other vital AF functions. Opportunity - nonlinear phase conjugation techniques offer a means to automatically correct phase distortion of optical beams caused by the atmosphere, imperfect optics or other phenomena. These techniques must be better understood, their limits explored and novel implementations considered before they can be applied to important AF problems. Objective - study nonlinear phase conjugation by Brillouin scattering including reduction of threshold using near resonant phenomena, effects of linear loss and geometric effects. Contribution - this work will supply understanding necessary to apply stimulated Brillouin scattering phase conjugation techniques to prevent distortion in AF optical systems.

The approach is mainly theoretical but will include some experimental verification. The effect of linear loss, especially in waveguides, on the stimulated Brillouin backscattered efficiency will be formulated and calculated. Ultimate limits imposed by such processes will be studied. Resonance enhancement of phase conjugation by stimulated Raman or Brillouin scattering will be theoretically studied and experiments using dye lasers to excite dyes in waveguides will be used to verify theory. Short pulse (transient) effects will be explored. Possibilities of using polarization effects for nonlinear spectroscopy, especially at low frequencies determined by the difference in input optical frequencies will be explored.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0014, DIAGNOSTIC TECHNIQUES FOR MOLECULAR MULTIPHOTON ABSORPTION OF IR LASER RADIATION

C. Wittig, University of Southern California, School of Engineering, Dept. of Electrical Engineering, *3551 University Ave., Los Angeles, California* 90007 (ENG76-82560)

This research involves a series of diagnostic experiments to measure fundamental processes in molecular multiple photon IR absorption. This phenomenon, which can lead to dissociation of molecular species on a collisionless time scale, has been shown to be useful for laser isotope separation and offers the possibility of laser controlled chemistry. The proposed experiments address the following two questions. First, what is the distribution and fate of the vibrational energy that a molecule gains from the laser field in the absence of photodissociation? Second, what are the specific product channels for photodissociation and how can these product channels be monitored and controlled?

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science

4.0015, HIGH CAPACITY LASER HOLOGRAPHIC DATA STORAGE

T.K. Gaylord, Georgia Inst. of Technology, School of Electrical Engineering, *225 North Ave. N.W., Atlanta, Georgia* 30332 (ENG76-81707)

A research project will be undertaken to obtain detailed understanding of optically and electrically induced refractive index changes in electrooptic crystals. Particular emphasis will be directed toward the implementation of high capacity holographic information storage and retrieval and optical grating devices. A comparison will be made of the terminal characteristics of volume hologram gratings predicted by dynamic theory and experimental results in electrooptic crystals. Several holographic data storage experiments will be conducted including volume superposition of data, coherent selective erasure, digital logic operations, optical noise, and multiphoton recording.

This action renews the research that is being conducted under NSF Grant ENG75-14456.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Engineering & Applied Science

4.0016, NEAR-EQUATORIAL PLASMASPHERE
T.H. Roelofs, University of Hawaii System, Manoa Campus, School of Engineering, Dept. of Electrical Engineering, *Bachman Hall, Honolulu, Hawaii* 96822 (DF580190; F19628-78-C-0050)

AF function - time delay errors produced in satellite navigation and detection systems. Deficiency - present models of ionospheric time delay do not include the contribution of electrons from heights above approximately 1000-3000 kilometers, a region called the plasmasphere. In the equatorial anomaly region where the ionospheric time delays are the world's highest the additional contribution to total time delay of the plasmasphere is unknown. Objective - measure the diurnal and seasonal plasmaspheric electron content during magnetically quiet and disturbed conditions. How research contributes - these results will be used to improve existing models and prediction techniques for time delay to operational satellite detection radar and navigation systems particularly when operating in the Pacific equatorial anomaly region.

The plasmaspheric electron content will be found by making simultaneous measurements from a ground station in Hawaii of the true group delay and the Faraday rotation of radio waves transmitted by an ionospheric beacon transmitter on board the geostationary satellite ATS-6. This satellite is located at 140 degrees west longitude, well suited for making these measurements from the Hawaiian equatorial anomaly location. The difference between the electron content as measured by the two techniques, after suitable corrections, is the plasmaspheric electron content. Measurements will be made for approximately 2 years to determine the diurnal and seasonal behavior of this parameter during magnetically quiet and disturbed conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

4.0017, OPTICAL TECHNIQUES TO MEASURE DISPLACEMENTS AND STRAINS IN SOLIDS
C.A. Sciammarella, Illinois Inst. of Technology, School of Engineering & Physical Science, Dept. of Mechanics & Mechanical & Aerospace Engineering, *3300 S. Federal St., Chicago, Illinois* 60616 (ENG77-24302)

The objective of this research program is to develop optical techniques (holography, moire and speckle interferometry) for the measurement of stresses and strains in solids.

These developments include faster and more efficient data processing techniques, significant increase in the magnitude of resolution, easier and simpler methods of application, and possible new areas of utilization.

These advances will find application in a number of areas of technological importance, such as the study of complex structural and machine elements, in the study of material properties, as well as in nondestructive inspection techniques and fracture mechanics.

This action provides additional support for ENG 75-11160.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Engineering & Applied Science

4.0018, UNSTEADY FREE CONVECTION
R.J. Adrian, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Theoretical & Applied Mechanics, *207 Engineering Hall, Urbana, Illinois* 61801 (ATM77-22936)

This project will perform investigations of unsteady turbulent free convection in horizontal layers of fluid that are heated from below and bounded above by either an insulating surface or a layer of stable fluid.

The purposes of this investigation are to provide detailed information of the structure of turbulence in turbulent flows, including joint higher order moments of temperature and velocity, and to use these data to evaluate and implement certain higher order models of buoyancy driven turbulence which have been proposed for modeling the planetary boundary layer. Measurements will be made of the fluctuating local temperatures, vertical velocities, and horizontal velocities along horizontal lines in the fluid layer by simultaneously scanning a temperature sensor and the measurement volume of a two component laser Doppler velocimeter through the fluid.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

4.0019, HIGH-RESOLUTION METEOR WINDS RADAR OBSERVATIONS
S.A. Bowhill, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801 (ATM76-01773 A01)

This grant funds the continued operation of the University of Illinois' meteor wind radar, begun under National Science Foundation grant ATM-7601773. Data taken under this program will be analyzed for studies of the dynamics of the mesosphere and lower thermosphere, particularly to investigate vertical tides and their temporal variability in the 80-110 km region, internal gravity waves, and the relation between neutral winds and ionospheric motions.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

4.0020, LARGE SCALE SYSTEMS
J.B. Cruz, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801 (ENG74-20091 A01)

The general objective of this research is to develop a unified approach to the modeling and control of large scale systems with uncertainties.

The first part of the study will examine structural aspects, such as controllability and resulting related design possibilities, of interconnected systems. The principal aim is to obtain results in terms of subsystem and interconnection properties only, without having to examine the large composite system model.

The second part will develop methods for the simplification of large dynamic systems by the use of different time scales which model slow and fast phenomena (singularly perturbed models). This inherent time scale separation offers an interesting possibility for decomposition and decentralization of design, control and optimization problems for large scale systems.

The third part will investigate dynamic game structure where the control action is applied simultaneously by many decision-makers with different objectives. The Stackelberg strategy will be adapted to coordinate subsystems.

The final part will investigate parameter uncertaintity in large systems from both the sensitivity viewpoint (regarding the parameters as deterministic with fixed but unknown values) and the stochastic viewpoint. The goal is to develop methodologies for decentralized control which are robust to modeling uncertainties.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Engineering & Applied Science, Div. of Electrical Computer & Systems Engineering

4.0021, COHERENCE BANDWIDTH STUDY
K.C. Yeh, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801 (DF582040; F19628-78-C-0195)

AF function - satellite communications. Deficiency - inadequate knowledge of the effects of ionospheric scintillations on trans-ionospheric radio propagation. Objective - study the coherence bandwidth and pulse distortion through naturally occurring and artificially modified ionospheres. How research con-

tributes - with a greater understanding of the degradation that occurs on the propagation path due to intense scintillations, mitigating techniques can be implemented to improve the reliability of satellite communications.

The mutual coherence functions will be determined and applied to study the coherence bandwidth under various ionospheric and propagation conditions. Experimental data will be compared with theoretical results and used to evaluate the effects of the nuclear disturbed ionosphere.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0022, PROGRAMMABLE SELF-CUEING KEYBOARD ASSEMBLY FOR INTEGRATED AVIONICS

T. McCreery, Bomar Instruments Corp., *Fort Wayne, Indiana* (DN081111; N62269-78-C-0151)

The Navy's advanced integrated display system AIDS program is to develop a totally new concept in modular cockpit instrumentation for naval air missions, requiring exploratory development of new display materials and techniques. A flat programmable self-cueing keyboard assembly is directly applicable to the type of display required by the AIDS programmable panel display. This contract supports work unit ZA601, Agency Accession No. 681080.

A 25 key station keyboard utilizing light emitting diode displays is to be developed and evaluated in the areas of cueing assembly, actuator plate concept, and optimum force level. A prototype keyboard is to be designed and developed for evaluation and demonstration.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

4.0023, RESPONSE OF THE CARDIOVASCULAR SYSTEM TO VIBRATION AND COMBINED STRESSES

C.F. Knapp, University of Kentucky, School of Engineering, Dept. of Mechanical Engineering, *Limestone & Euclid, Lexington, Kentucky* 40506 (DF053900; F49620-79-C-0034)

AF function - environmental stresses such as acceleration and/or vibration may severely compromise aircrew performance. Circulation may be extended to critical limits since it is directly affected by these forces and is indirectly involved in all adjustments of the body to environmental stress. Deficiency - with the recent development and deployment of high speed terrain-following tactical aircraft, operational crews are exposed to a dynamic acceleration environment with a significant frequency content below 1.0 Hz for extended periods of time. There is an acute lack of information available concerning responses at frequencies below 1.0 Hz. The design of effective countermeasures to acceleration stress depends upon the understanding of the mechanisms responsible for cardiovascular regulation. Because of the invasive nature of the instrumentation required for assessing cardiovascular responses, studies will be performed using chronically instrumented canines. Objective - the proposed studies are designed to 1) yield needed quantitative information about the cardiovascular system's ability to function in, and adjust to, ultra low frequency acceleration environments, and allow a qualitative evaluation of the possible hazards of exposure to such acceleration stress, and 2) to provide a means of analyzing the frequency response of the cardiac and vascular control mechanisms, acting to maintain circulatory integrity, during exposure to these dynamic, total-circulatory (i.e. whole body) acceleration loadings. How research contributes - this effort will provide the background required for the design and implementation of human investigations which would lead to improved protective equipment and operational procedures for military personnel exposed to the acceleration environment resulting from the optimal utilization of advanced aerospace systems.

Emphasis will be placed on 1) the quantification of the frequency response characteristics of cardiovascular regulation, using Fourier analysis, with a shifting of focus toward specific receptors, i.e. carotid sinus pressure, venous volume and the vestibular apparatus with specific peripheral vascular effectors acting and 2) the identification of the source of the increase in mean arterial pressure associated with oscillatory acceleration loading, a pressure increase which appears to be independent of autonomic effector activity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0024, APPLICATIONS OF ENGINEERING METHODS IN PLASMA SCIENCE

H. Lashinsky, University of Maryland, College Park Campus, Inst. for Fluid Dynamics & Applied Mathematics, *College Park, Maryland* 20742 (ENG77-02128)

The objective of this program is to examine the supression of low-frequency instabilities in a plasma in a magnetic field by the application of high-frequency electric fields. Specific problems to be treated include: 1. Stabilization of the collisionless drift instability by the high-frequency transverse (to the magnetic field) electric fields associated with the lower-hybrid resonance. 2. Stabilization of the collisionless drift instability by the application of high-frequency parallel electric fields. 3. Development of noncontact methods for the introduction of a high-frequency electric field with known spatial distribution and amplitude into a plasma. 4. Coupling to the lower hybrid resonance in a bounded plasma of dimension comparable to the wavelength. Experimental aspects of the research will be performed on a Q machine.

This is a continuation of research previously supported under NSF grant ENG-7604635.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science

4.0025, PHOTOCONDUCTIVITY EFFECTS IN SEMICONDUCTORS FOR PICOSECOND OPTOELECTRONIC DEVICES

C.H. Lee, University of Maryland, College Park Campus, School of Engineering, Dept. of Electrical Engineering, *College Park, Maryland* 20742 (ENG78-06862)

This program is examining the photoconductivity effects in semiconductors which are induced by picosecond laser pulses. Since photo-induced carriers can be generated very rapidly, an optoelectronic switching device based on photo-conductivity effects can be built with picosecond response time and precision. This study focuses on methods for implementing switching devices and on measurements of device operation. The program includes an investigation of: (a) electronic recombination processes in semiconductors, (b) Ridley-Watkins-Hilsum inter-valley scattering effects and their relation to device characteristics, (c) generation of multi-kilovolt electric impulses, (d) microwave switching, (e) the use of the devices as ultrafast optical detectors, (f) two-photon photoconductivity laser intensity correlation with picosecond resolution, and (g) new materials suitable for bulk photoconductivity switching applications.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science

4.0026, ASTROMETRIC INTERFEROMETER

D.H. Staelin, Massachusetts Inst. of Technology, School of Engineering, Dept. of Electrical Engineering, 77 *Massachusetts Ave., Cambridge, Massachusetts* 02139 (AST77-06052 A01)

Optical stellar interferometry techniques show promise of being able to improve the measurement of stellar positions by a factor of 10 to 15 over conventional techniques. Such an advance greatly increases the chances for detecting neutron stars, black holes, and planets around nearby stars.

An existing pilot model interferometer with a 1.6 meter base line will be improved and the basic system concepts will be demonstrated with observations of bright stars. Basic data about the propagation of starlight through the atmosphere will be obtained. Such data will be necessary for the design of future high-resolution interferometric instruments.

This is a continuation of research previously funded under NSF grant AST 77-06052.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

4.0027, DESIGN & DEVELOP AEROSPACE RESEARCH INSTRUMENTS

S.J. Rachefort, Northeastern University, School of Engineering, Dept. of Electrical Engineering, *360 Huntington Ave., Boston, Massachusetts* 02115 (DF242400; F19628-78-C-0218)

AF function - nuclear weapons delivery, communications, detection, track and intercept stratospheric operations. Deficiency - inability to forecast atmospheric interactions affecting the design and operation of military systems such as reentry vehicle, over-the-horizon radar, polar communications and satellite ephemerides. Insufficient data to accurately predict environmental effects of stratospheric operations. Objective - to increase ability to forecast atmospheric variables requires measurements by sounding rocket and balloon experiments. How research contributes - provides instruments for conducting experiments measuring the composition and densities of ion and neutral species of importance to AF systems operations.

The contractor will design and operate electronic instruments for mass spectrometer and related experiments as required for a series of rocket- and balloon-borne ion and neutral atmospheric composition measurement programs. The design of each experiment will be coordinated with parallel laboratory and other related programs while being updated according to the results of the preceding experiments. Research, development and test of components and assemblies are undertaken to create reliable operating instruments for rocket and balloon experiments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0028, SATELLITE/SPACE PLASMA INTERACTION STUDY

U. Samir, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Electrical & Computer Engineering, *Ann Arbor, Michigan* 48104 (DF582420; F19628-79-C-0060)

AF function - communication, navigation, command and control. Objective - to determine the structure of the plasma sheath and wake in the vicinity of a satellite and to perform a parameter study relating satellite velocity, altitude, ambient plasma density, temperature and energy. Examine effect of spacecraft induced plasma oscillations on the reliability of in-situ plasma measurements from spacecraft. Develop an empirical model of the sheath structure for the low altitude satellites DMSP, S3-2, S3-3, Space Shuttle (STS) and the synchronous orbit AF satellite, SCATHA. How research contributes - defines and quantifies spacecraft sheath and charging properties enabling the effects on communications equipment and electrical and optical sensing systems to be evaluated.

A parametric study of problems involved in spacecraft-space plasma interactions at low altitude utilizing in-situ measurements made aboard Air Force satellites including the S3-2, S3-3 and DMSP will be made. SCATHA sheath and wake studies will be undertaken utilizing the electron and ion plasma data for modelling synchronous orbit conditions. Use results from the study to set up a definite experiment using space shuttle which will study plasma interactions with experimental bodies under closely monitored conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0029, FRESNEL LENS AND BEAM CONTROL IN OPTICAL WAVEGUIDES

W.S. Chang, Washington University, School of Engineering & Applied Science, Dept. of Electrical Engineering, *4559 Scott Ave., St. Louis, Missouri* 63130 (DF055880; F49620-79-C-0145)

AF function - advanced Air Force weapon systems require the real-time processing of data obtained from a multitude of sensors at data rates which exceed current capabilities. This requirement necessitates the development of analog parallel processing techniques such as optical or acousto-optical processing. Opportunity - an integrated optical format must be found before such processing can be realizable onboard aircraft and missiles. Objective - this research will use Fresnel diffraction in an attempt to fabricate efficient and inexpensive waveguide lenses for integrated optical systems. How work contributes -the effort advances optical processors for avionics and command/control systems.

Fresnel lenses in high index of refraction waveguides such as lithium niobate will be analyzed, designed, fabricated, and experimentally evaluated. New phase reconstruction methods and volume holographic techniques will be investigated for their capability to improve Fresnel lens performance in such respects as side lobe reduction, better efficiency, and larger signal-to-noise ratios. Microfabrication techniques will be studied in an attempt to discover batch fabrication methods for the lenses.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0030, TRANSITION TO TURBULENCE IN SHEAR FLOWS

A. Demetriades, Montana State University, Graduate School, *Bozeman, Montana* 59715 (DF055600; F49620-79-C-0210)

AF function - aerospace vehicles. Deficiency - methods for predicting the transition to turbulence of shear flows, i.e. free shear layers, boundary layers, wakes and jets, is not adequate at present for most design applications. Objective - development of a verified predictive method for the laminar-turbulent transition of all shear flows, including the effects of Mach number, heat transfer, surface roughness and pressure gradient. How work contributes - a criterion for establishing the transition distance of shear flows will aid the design of many systems of interest to the Air Force such as the prediction of boundary layer transition of blunted nose types on reentry vehicles, the change of the transition distance due tothe growth of roughness caused by ablative pitting and the transition of shear layers and wakes in gas flow lasers.

An analytical study of flow data in the published literature will be conducted to evaluate the concept of a threshold or minimum turbulence Reynolds number for all classes of shear layers and how it will vary depending on the flow parameters of Mach number, heat transfer rates, surface curvature, roughness, pressure gradient, etc. This approach appears to be profitable due to the early successes of the principal investigator in the predictions for wakes and boundary layers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0031, CHARACTERIZATION OF THE RADIATION DAMAGE TO ELECTROOPTIC COMPONENTS

B.H. Rose, U.S. Dept. of Defense, Air Force, Weapons Lab., *Kirtland Air Force Base, Albuquerque, New Mexico* 87117 (DF196460)

The objective of this program is to provide detailed information on the effects of radiation - in particular solar radiation - on solid-state and electrooptic components. Ultimately, this information will be used not only to assess the vulnerability of these components, but also to develop techniques that can enhance the radiation hardness of satellite components.

DDC literature search No. ACR20F accomplished. Degradation of relevant device parameters will be measured as a function of proton beam energy desposition and gamma dose rate and total dose. Initial measurements will be of power output and minority carrier lifetime in LED's and of efficiency in solar cells. In addition, transient capacitance measurements will be made on the junctions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

4.0032, ROTOR BEARING DYNAMICS DESIGN TECHNOLOGY

C.H. Pan, Shaker Research Corp., *Northway 10 Executive Pk., Ballston Lake, New York* 12019 (DF458690; F33615-76-C-2038)

Update current AFAPL-TR-65-45 series to reflect state-of-the-art advanced and to clarify certain sections.

Review current volumes, literature, and practice to establish areas for update, correction, and/or additions. Rewrite and restructure the guides to reflect and improve ease of use. Add volume on gas lubed foils and pneumomechanical critical speed control. Provide for systematic update.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0033, INTRASYSTEM EMC SUSCEPTIBILITY

D. Weiner, Syracuse University, L.C. Smith College of Engineering, Dept. of Electrical & Computer Engineering, *Link Hall, Syracuse, New York* 13210 (DF930410; F30602-78-C-0083)

The objective of this effort, entitled Intrasystem Electromagnetic Compatibility Susceptibility Study, is to examine the electromagnetic interference (EMI) behavior of devices such as fuel gauge indicators, electroexplosive devices, logic circuits, display units, etc.

The approach will be then to determine EMI performance curves for such devices. These performance curves will relate device degradation to various interference signal parameters.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0034, ANTENNA RESEARCH

C.J. Drane, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF904550)

AF function - communication and surveillance. Deficiency - antennas that are rendered ineffective for practical applications by their great expense, immobility, high drag coefficient, susceptibility to jamming, high sidelobe levels, low gain, and narrow-bandedness. Objective - to provide fundamental technical basis for antennas that are cost-effective with more precisely predictable sidelobes; have high gain and easy portability; are low profile with minimal aerodynamic drag; have wide angular scan capability; are significantly less vulnerable to enemy jamming; have sidelobes that can be selectively reduced; can operate on a dual frequency basis. How research contributes - provides antenna technology for OTH backscatter detection radars, emergency communications, high performance aircraft, aircraft-to-satellite communications, tactical surveillance, radiation defense of ground-based radar and communications systems, and broadband communications capability.

Judicious loading of array elements to significantly mitigate interelement mutual coupling; perturbative and iterative adjustment of dipole lengths and spacings along a transmission line whose characteristic and terminating impedances are also parameters in maximizing the gain; investigation of radiation mechanisms, basic element properties and bandwidth of microstrip antenna arrays, surface wave concepts combined with phased array principles for high gain and efficiency over wide angles. Integrated design of reflector and offset feed for very low sidelobes; spatial filtering screens in immediate foreground of antenna arrays for selective reduction of sidelobes; short-backfire antenna structure combined with concentric loop for dual frequency operation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0035, THERMAL ENERGY STORAGE AND HEAT TRANSFER INVESTIGATION

J.E. Beam, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF458500)

To develop the required analytical and experimental heat transfer and metallurgical compatibility data necessary to optimize the design and usable life for surveillance spacecraft via cryocooler applications.

A two phase program is proposed. Phase I concerns analytical modeling of transient cycling of cylindrically encapsulated TES phase change materials, setting up an in-house test capability to allow thermal cycling of liquid metal heat pipes with integral TES, and initiating in vacuo metallurgical clad/TES compatibility tests. Phase II centers on calorimetric testing and cyclic performance mapping of subscale thermal trains and contractual end item hardware.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0036, PLASMA PROPERTIES OF GAS LASERS

P. Bletzinger, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF458840)

AF function - electrical discharges applied to gas laser and high power technology. Deficiency - present electrical discharge lasers are limited in performance and lifetime by discharge instabilities, contamination and electrode or boundary effects. Research - the in-house experimental program uses sample discharges such as DC, RF or microwave, UV or electron-beam preionized plasmas as representative of those used in lasers or high power switches of current AF interest. The application of a wide variety of excitation methods and diagnostics will permit a detailed and accurate determination of the characteristics, limitations of and possible improvements to these discharges. How research contributes - this research supports several Air Force requirements in the area of medium and high power lasers in the infrared and visible wavelength range as well as switch technology. Research also supports data requirements of theoretical studies under work unit 12.

The research program uses small in-house experiments to generate and analyze accurately defined CW or pulsed discharges. Excitation methods include standard very high stability DC discharges, pulsed and DC RF and microwave discharges as well as pulsed and DC UV or electron-beam preionized discharges. The diagnostics are compatible with the well-defined discharges and include time resolved spectroscopy from the vacuum UV to medium infrared and electrical diagnostics. Presently, emphasis is on the analysis of population distributions in molecular gases under various excitation conditions, analysis of preionization mechanisms and seed characterization of UV preionized discharges and instability mechanisms in conventional and e-beam discharges. Future plans call for research on electronegative discharges relevant to lasers and switches.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0037, COMBUSTION MODELING STUDIES

R.P. Bradley, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF461200)

Design and run experiments to evaluate existing combustor models.

The experimental design will determine: (1) combustor configuration, (2) initial conditions, (3) fuel type, (4) spatial measurement locations, and (5) model predictions of temperature, species concentration, and velocity profiles. Advanced optical techniques will be used to make the desired profile measurements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0038, BEARING RESEARCH FOR PROPULSION AND POWER SYSTEMS

J.F. Dill, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF451070)

Raise R. E. bearing capability to three plus mission DN, extend bearing fatigue life and increase steel fracture toughness through better materials, increase the understanding of the fundamentals of lubrication dynamics, increase the capability of computer modelling of bearing operation.

Document the result of existing R. E. bearing analyses, conduct full scale bearing tests to verify fatigue capability, perform dynamic measurements of lubricant film thickness and traction characteristics, investigate the physical properties of lubricants needed for dynamic modelling.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0039, CORRELATION VELOCITY SENSOR FLIGHT TEST

N.R. Banks, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF116760)

An inertial navigation system (INS) of the type required for accurate navigation of penetrating manned bombers, remotely piloted vehicles and cruise weapons, provides continuous estimates of vehicle position, velocity, and ground track angle. The accuracy of these estimates degrade with time unless the INS is periodically 'updated' by data derived from external sensors. Accurate velocity-updating, of the order of 10.5 ft/sec precision, can reduce the position-estimate error-rate of a 6000 ft/hour ins to about 1500 ft/hour, a four to one performance improvement. A sensor concept for obtaining such accuracy, known as the correlation velocity sensor (CVS), combines an interferometer receiving antenna system with a pulsed radar altimeter to generate and process radar returns into estimates of flight speed and heading. Flight tests to two breadboard CVS units under a Navy/Air Force program have demonstrated CVS feasibility but the accuracy achieved was about an order of magnitude below Air Force. The prime objective of this program is to perform flight test evaluation of the brassboard CVS units in an AF fixed-wing A/C to demonstrate that performance requirements can be met.

A Program Introduction Document (PID) has been submitted to 6585TG and 4950TW stating the requirements of the CVS flight test, Proj 688G funds will be requested by 6585TG to perform the flight test program. The Navy will deliver the CVS equipment to the Air Force on 01 Oct 78.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0040, HARMONICS CANCELLATION SYSTEM

S. Harris, General Atronics Corp., *1200 E. Mermaid Ln., Philadelphia, Pennsylvania* 19118 (DF912600; F30602-78-C-0191)

The objective of this effort is to further investigate the generation of harmonics from high power HF transmitters aboard aircraft which interferes with the reception of weak VHF/UHF signals, and if necessary, to investigate nonlinear interference cancellation system (NICS) techniques to solve the problem. Our investigation to date has been chiefly concerned about HF harmonics into AFSATCOM and reconnaissance type receivers, however, it should have direct application to possible future problems such as a. HF/VHF harmonics into SEEK talk, b. VHF/UHF harmonics into JTIDs, and c. VHF/UHF harmonics into NAVSTAR (global positioning system).

The study phase shall include lab, ground and airborne testing on special mission aircrafts to determine the locations of the various harmonic generators. Once a specific nonlinearity has been located, then a solution considering the technical, economical and operational aspects should be investigated. (Example - if a simple filter will eliminate a particular harmonic generator, then that will be the recommendation.) Over the past year, six harmonic generators have been isolated and their effects minimized but there still exists an interference level 12 db above AFSATCOM receiver sensitivity. The number of remaining harmonic generators on these aircraft is unknown at this time. If a NICS appears to be the technical and economical solution to a specific harmonic generator, then the amplitude/phase characteristics of that nonlinearity has to be accurately determined. Consideration also has to be given to the nonlinearity location relative to the transmitting and receiving antennas, including the case of multiple nonlinearity locations. Thereafter, a variety of NICS techniques shall be examined by analysis, computer simulation and/or laboratory experiments to verify their applicability. The second phase is the actual design of the NICS. Techniques considered must apply both for AM and FM modulation on the offending transmitter without distorting the desired signal. The last phase is the fabrication and testing of a breadboard model.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0041, DEVELOPMENT OF DISTRIBUTED PROCESSING SYSTEM GENERATOR PROGRAM

C. Czaplicki, U.S. Dept. of Defense, Navy, Naval Air Development Center, Software & Computer Directorate, *Warminster, Pennsylvania* 18974 (DN081147)

Distributed computer configurations have been projected as the next generation architecture for various avionics platforms. The system generation software provided to day only accommodates one loadable processor. The objective is to explore and develop new approaches for system generator which could provide coordinated loadable software for all the loadable devices within a distributed processing architectures. The goal is a system generator which will provide the load files for the processors within various platform configurations.

The approach of this effort is to review the currently available system generators and investigate new approaches which will expand their capability for more than one processor. There has been very little effort expended on a distributed computer system generator for the avionics application. Items to be investigated are configuration management, recovery, loader interfaces and multi-computer loader directives.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0042, RADIATION HARDENED MNS DEVICE RESEARCH

D.J. Dumin, Clemson University, School of Engineering, Dept. of Electrical & Computer Engineering, *Rhodes Research Bldg., Clemson, South Carolina* 29631 (DF905360; F19628-79-C-0094)

AF function - guidance, navigation, communication. Deficiency -metal-nitride-oxide-semiconductor (MNOS) technology is the only non-volatile microelectronic memory technology but is still a very immature technology. A variant on this structure, metal-nitride-semiconductor (MNS) with a thermally grown nitride layer, offers tremendous potential for reliability and radiation hardness, but has only been successfully accomplished recently in Japan. Objective is to develop a thermal nitride growth process for radiation hardened MNS memory. How research contributes - radiation hardened, reliable, non-volatile semiconductor memories are essential to Air Force satellite and missile systems. This research will advance the development of such memories and also advance the metal-insulator-semiconductor (MIS) technology in general.

Develop a reaction facility for the thermal nitridation of silicon. Characterize silicon-nitride films as a function of growth parameters to optimize growth process. Fabricate MNS test devices to determine the effects of nitride growth parameters on device function, reliability and radiation hardness.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0043, TRAJECTORY OPTIMIZATION FOR A MIXED-MODE SINGLE STAGE NUCLEAR SURFACE-TO-ORBIT SHUTTLE

T.C. Powell, University of Tennessee, Central Office, Space Inst., Dept. of Mechanical Engineering, *Tullahoma, Tennessee* 37388 (DF055350; F49620-79-C-0166)

AF function - space defense. Opportunity - optimization of trajectory for a mixed mode single stage nuclear surface-to-orbit shuttle. Objective - research will be performed to obtain the characteristics of optimum trajectories of single stage orbiting vehicles launched from the equator. How work contributes - future surveillance satellites may use single stage nuclear shuttles. To place a given payload in orbit the optimum trajectories for minimum initial mass are desirable.

Performance calculations will be performed for a single stage shuttle operation. The engines will be designed to operate in two modes, a) low specific impulse propellants, and b) high specific impulse propellants.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0044, DULLES INTERNATIONAL AIRPORT IMPROVED ACCESS IMMEDIATE ACTION PROGRAM
D.F. Erion, Northern Virginia Transportation Commission, *2030 16th N. Arlington, Arlington, Virginia* (193159 (HRB NO.))

The purpose of this demonstration project is to determine whether improved high speed bus service can shift some air passengers from the more accessible National Airport to the relatively less accessible Dulles Airport. A secondary purpose is to test the effectiveness of such an improved bus service to induce a modal shift from autos and taxis to a higher occupancy mode. The project seeks to improve ground access via mass transit to Dulles Airport through traffic engineering improvements, increased visibility of bus service, increased awareness of the services available and improved perception of the existing service.

SUPPORTED BY U.S. Dept. of Transportation, Urban Mass Transportation Admin.

4.0045, NIOBIUM BASED JOSEPHSON JUNCTIONS
J.E. Nordman, University of Wisconsin, Madison Campus, School of Engineering, Dept. of Electrical Engineering, *Madison, Wisconsin* 53706 (ENG74-24227 A02)

The primary objective of this research is to understand and perfect the niobium (Nb) based Josephson tunnel junction. Specific goals include: 1) the determination of the mechanisms responsible for leakage current, the anomalous negative resistance, and the reduced maximum DC Josephson current - all now observed as functions of fabrication parameters in Nb-Nb oxide-lead (Pb) junctions; 2) the fabrication of junctions exhibiting repeatable behavior using semiconductor barriers which can be altered in a controlled way either by doping, optical injection or the field effect; 3) the determination of the limits to the efficiency of coupling of elecromagnetic radiation to Nb tunnel junctions through either the Nb or the Pb film.

The Nb based junction will be studied because of its great potential for use in practical Josephson devices. In that regard, effort will be directed toward achieving one or more of the following: a better circuit model for Nb junctions, development of a low leakage Nb-barrier-Nb junction, development of efficient high frequency emitters or detectors development of reliable high current density junctions.

This is a continuation of research previously supported under NSF Grant ENG-7424227.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science

4.0046, RESEARCH IN FLUID DYNAMICS
J. Sandford, Von Karman Inst. for Fluid Dynamics, *Rhode St. Genese, Belgium* (DF289780; AFOSR-79-0033)

AF function - research in aerodynamics. Deficiency - there exists a need to better understand the relationship between aircraft design parameters and noise. Aircraft noise contributes to detection, structural fatigue and associated maintenance problems. Research - the research will investigate wing-propeller interactions and their effect on aircraft noise. How research contributes - the research will contribute to the evolution of criteria which will aid in the design of low-noise propeller-driven aircraft. This program is part of a long range VKI effort and support of this low level will facilitate transfer of this data in the future.

A model will be constructed which will allow the location of a pusher propeller to be varied relative to the wing. Complete polars will be measured and simultaneously noise measurements will be recorded at various positions outside the test station. The effect of background windtunnel noise will be studied also. The tests will be conducted in the three-meter low-speed facility at VKI.

SUPPORTED BY U.S. Dept. of Defense, Air Force, European Office of Aerospace Research & Development

4.0047, SEMICONDUCTOR LASER DEFECTS
B. Thomas, University of Wales, Inst. of Science & Technology, *King Edward V I I Ave., Cardiff, Wales, United Kingdom* (DF902680; AFOSR-77-3206)

AF function - airborne and ground communications. Deficiency/opportunity - existing wire systems deficient in terms of bandwidth, security susceptibility, electrical interference. Objective -investigate switching characteristics of light sources for fibers. How research contributes - establish limitations on pulse operation of various laser diodes.

Fast rise time pulse measurements will be undertaken on various laser structures. Delay, 'q' switching, etc. will be investigated and in certain instances deliberately induced through material defects from neutron irradiation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, QUANTITATIVE MAGNETOSPHERIC B-FIELD MODELS FOR THE INTERNATIONAL MAGNETOSPHERIC STUDY
J.G. Roederer, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM78-09459)

For many research purposes, both theoretical and experimental, it is necessary to have a mathematical model of the Earth's magnetic field. A model in this sense means a numerical algorithm (e.g., a computer program) that, given the coordinates of a point in space, will return the value of the vector magnetic field at that point. There currently exists a fair variety of such models with widely varying properties, accuracies, and features. This grant funds a program of systematic evaluation, testing, intercomparison, and updating of these models. The objective of this work is to establish a series of magnetospheric models with clearly defined properties, merits, and limitations. This will permit improved theoretical and experimental studies of effects of the interplanetary magnetic field on Earth's magnetic field, ring current configurations, and neutral sheet current distributions.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0002, REFURBISHMENT AND ENGINEERING SUPPORT OF RECOVERED PAYLOAD RECOVERY SYSTEMS
E. Allen, Space Data Corp., *Tempe, Arizona* (DF249840; F19628-78-C-0015)

AF function - recovery of aerospace payloads. Deficiency - economical recovery of small diameter sounding rocket payloads. Objective - to provide the AF with reliable, accurate, and low cost recovery systems for small sounding rocket payloads. How research contributes - will result in an inventory of reliable recovery systems that will enable scientific payloads to be recovered, refurbished and reflown, thereby reducing the per mission cost of sounding rocket research projects.

The AF intends to contract for the refurbishment of recovered, recovery systems. It is intended that four GFE systems per year will require refurbishment in each of three years.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0003, EPHEMERIDES SYSTEM APPLICATIONS
J. Bass, Logicon Inc., *21535 Hawthorne Blvd., Torrance, California* 90503 (DF581670; F19628-77-C-0254)

AF function - ephemerides systems applications for research on physics of upper atmosphere. Deficiency - requirement for continual modification and maintenance at state-of-the-art level for current vehicles of interest and any future launches. Objective - advancement and improvement in orbital parameter accuracies as required by researchers investigating experimental results. How research contributes - determination of atmospheric effects, e.g., density of atmosphere, atmospheric drag on a vehicle, geomagnetic effects during periods of high, medium and

low solar activity, as well as improvements in earth modelling and continuing investigations of auroral zone data.

Provide analysis of experimental data from the upper atmosphere utilizing specialized methods of analysis to perform atmospheric modelling using spectral analysis, statistical analysis and other numerical methods.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0004, STUDY OF MONSOON DISTURBANCES IN THE VICINITY OF TAIWAN AND SOUTH CHINA SEA

C. Chang, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* 93940 (INT78-14557)

This award provides travel support for Dr. Chih-Pei Chang, Associate Professor of Meteorology, Naval Postgraduate School, to collaborate with scientists of National Taiwan University on study of large-scale monsoon motions and the associated subtropical and tropical disturbances during the summer and winter seasons in Southeast Asia. The project has been approved under the United States - Republic of China Cooperative Science Program and support for National Taiwan University investigators will be provided by the National Science Council of the R. O. C. The cooperative research will include: (1) study of the Mei-Yu ('plum-rain') systems in the vicinity of southeastern China and Taiwan during the early summer monsoon, and (2) study of the cold air surges off the Asian continent and their relationship with the convective activities in the South China Sea and maritime continent during the winter monsoon. Chang and his associates will collect data from sources in Taiwan and the U.S. These will be analyzed to obtain the structures and properties of atmospheric systems, their dynamic and thermodynamical mechanisms, their possible relationships with the broad scale circulations, and the methods for improved forecasting of these systems. Chang will provide advice on the establishment of special meteorological stations in the South China Sea during the Winter Monsoon Experiment of the Global Atmospheric Research Program.

SUPPORTED BY U.S. National Science Foundation, Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

5.0005, STUDENT RESEARCH

A. Smith, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (8DJ41190)

Research effort directed towards processes for solar-terrestrial phenomena to aid in the prediction of time and spatial occurrence of solar disturbances and their effects on the solar-terrestrial and near-earth environment.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

5.0006, CLIMATE PREDICTABILITY AND LONG RANGE PREDICTION

E.J. Pitcher, University of Miami, Rosenstiel School of Marine & Atmospheric Sciences, *4600 Rickenbacker Cswy., Miami, Florida* 33149 (ATM76-80604)

At present the detailed prediction of the daily weather is limited for practical purposes to just a few days. However, recognizing that the atmosphere is also subject to forcing on many different time scales longer than those associated with daily weather fluctuations, it may be possible to predict dynamically the atmospheric response in some averaged sense. Under the present project the principal investigator will investigate whether extended ranges of predictability are possible whenever time-averaged quantities are considered, rather than instantaneous values associated with day-by-day weather. A long-range prediction model suitable for making time-averaged predictions of the tropospheric height fields will be developed and tested. The method also involves the prediction of the temporal covariance structure of these fields and it is expected that knowledge of the variances would permit statements of variability of conditions during the forecast period. The research consists of both empirical and theoretical approaches.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0007, ANALYSIS OF COHERENT POLARIZATION DIVERSITY RADAR LIDAR FOR METEOROLOGICAL APPLICATIONS

J.I. Metcalf, Georgia Tech Research Inst., *Atlanta, Georgia* 30332 (DF582290; F19628-79-C-0076)

AF function - radar detection and identification of aerospace operational hazards. Deficiency - hydrometeor characteristics adversely affect the performance of many Air Force systems. Objective - perform a detailed systems analysis on the most suitable combination of coherent polarization diversity optical and/or microwave techniques for the remote determination of hydrometeor size distribution and phase. How development contributes - provides technique and system for remotely identifying weather phenomena affecting missile trajectories, communications links, and fire control radar paths.

The results of a previous study will be utilized to determine the effectiveness of various combinations of coherent polarization diversity radar and lidar systems in the remote sensing of the size distribution and phase of precipitation particles. A detailed analysis, including hardware performance trade-offs and hydrometeor definition capabilities, will be performed on the radar/lidar system which offers the most promise in measuring these particle characteristics.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0008, INFRARED FLUX IN THE EARTH'S ATMOSPHERE

L.D. Kaplan, University of Chicago, School of Physical Sciences, Dept. of Geophysical Sciences, *5734 S. Ellis Ave., c/o Hinds Geophysics Lab., Chicago, Illinois* 60637 (ATM76-81027 A01)

The purpose of this research is to continue to develop methods for determining the three-dimensional distribution of flux of infrared radiation in the earth's atmosphere and its relation to the temperature, pressure, composition, cloud and snow cover, and aerosol fields. Emphasis will be placed on obtaining maximum computational speed compatible with the accuracy requirements of general circulation and numerical weather prediction models. The role of absorption of radiation by ozone, clouds, and aerosols in the tropospheric circulation will be investigated with special attention given to radiative effects on the thermal structure and dynamics during periods of a few days to a few weeks. Continued work on the determination of the characteristics of a remote sensing system to obtain high vertical resolution in retrievals of temperature and water vapor distributions will also be performed under this grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0009, THE STRATOSPHERIC WATER VAPOR SINK IN THE WINTER ANTARCTIC

J.L. Stanford, Iowa State University of Science & Technology, College of Humanities & Sciences, Dept. of Physics, *Beardshear Hall, Ames, Iowa* 50010 (ATM76-15403 A02)

The processes by which water vapor is removed from the stratosphere are not well understood. The most promising candidate among these processes is a mechanism operating in the winter antarctic. However, the magnitude of this antarctic sink is in doubt by at least a factor of ten.

This research will utilize satellite-derived temperature information for the southern polar stratosphere in winter. These data will be used to calculate the maximum (saturation) amounts of water vapor which can be held by the cold stratospheric air, as a function of pressure (altitude), geographical position, and time. The difference between these amounts and the generally accept-

ed value for stratospheric water vapor content will be calculated and assumed to form precipitation particles. The stratospheric water mass removed is the total mass of these particles which are able to fall out of the stratosphere before evaporating in the warming air at the end of winter.

A second phase will refine the calculations by incorporating the effects of air circulation into and around the strong polar-night vortex and the effects of asymmetry of the cold air masses around the South Pole. A third phase of the research will utilize satellite radiance data from several years to determine the year-to-year variability of the stratospheric temperature structure in winter, allowing an estimate of the amount of water removed from the stratosphere during an 'average' year.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0010, THEORETICAL ANALYSIS OF HIGH RESOLUTION SPECTRA

W.S. Benedict, University of Maryland, College Park Campus, School of Arts & Sciences, Chemical Physics Program, *College Park, Maryland* 20742 (DF582540; F19628-79-C-0050)

AF function - target detection and backgrounds, satellite meteorology, surveillance satellite, detection of aircraft and missile plumes. Deficiency - limited knowledge of the high resolution spectral properties of atmospheric gases. Objective - provide improved molecular absorption parameters for computing atmospheric transmittance. How research contributes - provides analysis of available data and develops theoretical methods to compute atmospheric properties, transmittance and emission.

Laboratory measurements, solar spectral measurements, and planetary spectral measurements will be examined and analyzed in order to develop an improved compilation of atmospheric absorption line of methane and water vapor. Careful analysis of such data contributes to the mathematical techniques which allow extrapolations and interpolations to spectral line data not amenable to measurement.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0011, HIGH ALTITUDE DENSITOMETER PAYLOADS

D.H. Fryklund, Accumetrics Corp., *Cambridge, Massachusetts* (DF583310; F19628-79-C-0058)

AF function - airborne surveillance and weapons delivery. Deficiency - improved accuracy required for low altitude satellite ephemerides and impact prediction for AF operational RV's and weapons systems. Research - improved rocketborne accelerometers and telemetry systems for more accurate measurements in 50-150 km altitude range. How research contributes - density data in this altitude range can contribute significantly to improved impact prediction capability for ICBMs, RVs, increased computational accuracy for satellite ephemerides and improved model atmospheres that can result from an increase in the data base.

Work to be performed under this contract will consist of development, fabrication, testing, calibration, payload integration and technical field support of complete operational falling sphere payload systems ready for installation onboard a rocket vehicle. These instrumented payloads will enable atmospheric density to be determined with improved accuracy in the altitude region between 50 and 150 km. Also the work shall include post flight system analysis based upon flight results. This will enable an in-depth analysis to be made of flight performance so that subsequent units can be improved with regard to accuracy, reliability and survivability. Rocketborne density payloads developed under this contract will be launched at selected sites in response to AFGL and other AF programs and requirements.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0012, EWER PROBE EFFICIENCY STUDY

H.G. Norment, Atmospheric Science Associates, *363 Great Rd., Bedford, Massachusetts* 01730 (DF583580; F19628-79-M-0005)

Air Force function - strategic offense and defense. Deficiency -inability to accurately measure the liquid (or ice) water content of the atmosphere. This can degrade weapon system performance and affect aircraft operation. Objective - to accurately measure the concentrations of liquid water and/or ice mass of cloud systems. How development contributes - this study will permit more accurate measurements of atmospheric ice or water contents with the ewer instrument thereby providing accurate liquid water content (LWC) computations for quantitative assessments of environmental effects on aerospace operations.

Study the airflow in and about ewer probes to determine the efficiency of collection of hydrometeors and ice crystals as a function of size and shape.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0013, MATH AND PHYSICS STUDIES

N. Grossbard, Boston College, Chestnut Hill Campus, Graduate School, *140 Commonwealth, Chestnut Hill, Massachusetts* 02167 (DF247420; F19628-76-C-0147)

Research - upper atmospheric studies and rocket attitude determination. How research contributes - studies of high resolution solar data. Emission intensity studies in the earth's ionosphere and determination of dynamical motion of rockets.

Using numerical analysis, Fourier methods and integral equation techniques, mathematical models will be developed to test and improve the performance of space vehicles.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0014, CHARACTERISTICS OF POLAR CAP AURORA IN DMSP IMAGES FROM 1972-1976

M.S. Gussenhoven, Boston College, Chestnut Hill Campus, Graduate School, *140 Commonwealth, Chestnut Hill, Massachusetts* 02167 (DF053770; AFOSR-79-0012)

AF function - communication, surveillance, and detection systems operating in and through the high latitude ionosphere and magnetosphere are influenced by disturbances in the plasma medium resulting from energy disposition from the solar wind. Deficiency - there is no universally accepted theory of the reconnection process between the geomagnetic and interplanetary fields that occurs as the solar wind plasma is convected past the earth and of the attendant particle entry and acceleration mechanisms. Objective - the clarification of the nature, occurrence, and dynamics of polar cap aurora will provide an understanding of ionospheric and magnetospheric processes. Contribution - an understanding of the polar cap aurora will aid in monitoring and predicting magnetospheric substorm development.

The work proposed for FY79 is to analyze electric and magnetic field measurements made on the AF satellite S3-2. The S3-2 satellite complements the Air Force DMSP satellite SSJ/3 launched in June 1977, which in addition to the optical monitoring of the cap regions provides a 16 channel electrostatic analyzer to measure precipitating electrons from 50eV to 20 keV. The work is planned in three phases: the first phase will attend to the analysis of S3-2 electric and magnetic field data over the polar caps as it relates to polar cap auroral activity. The second phase will coordinate all results obtained in studying the polar cap environment to model polar cap conditions for a variety of solar wind and magnetospheric conditions. Finally, an attempt to order terms in a theoretical model of the polar cap will be made. This work is a continuation of work begun under F49620-77-C-0050.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of
Scientific Research

5.0015, EARTHQUAKE SOURCE PARAMETERS AND TECTONICS IN ASIA

P. Molnar, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (EAR77-23017)

Analysis of the tectonics of Asia using seismic data and LANDSAT photos will be continued. The seismic wave velocity structure of Tibet will be completed, fault plane solutions will be determined for events more recent than 1973, earth-

quakes in Asia will be relocated and a summary of the seismicity, including discussion of major events, will be completed. These data will be combined with detailed analyses of LANDSAT photos to determine the major active structures in Asia and their type and style of deformation. The areas of focus will first be the Tien Shan-Mongolia-Baikal region and then the Pamir and Burman regions. Some simple experiments will be carried out to try to understand the physical processes occurring in continents with layers of light, wet plaster overlying heavier, more fluid barite. These experiments will allow isostasy to hold and stress to be transmitted by the buoyancy of the thickened 'crust'. A series of simple numerical experiments will be carried out to explore the effects on the state of stress due to gravity acting on horizontal density gradients (mountains) and to explore further the slip line field analogy with Asian tectonics.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Earth Sciences

5.0016, METEOROLOGICAL STUDIES
L. Burke, Regis College, Undergraduate School, Dept. of Mathematics, *235 Wellesley St., Weston, Massachusetts* 02193 (DF248460; F19628-77-C-0010)

AF function - weather observing, analysis and forecasting for military operations. Deficiency - lack of adequate information and techniques to meet military weather support requirements. Objective -improvement of dynamical theory and techniques for weather analysis and forecasting (task 2310G2)- acquire, process and analyze satellite imagery data to develop short range prediction techniques (task 667008), extend the modular automated weather system capabilities in weather observing and forecasting (task 667010). How research and development contribute - provide improved weather analysis, forecasting and observing techniques in the following areas - mathematical models of atmospheric processes (task 2310G2)- improvement of DMSP satellite imagery and techniques for using AFGL man computer interactive data access system (MCIDAS) (task 667008), development of real-time use of advanced weather observing systems and automated weather forecasts and warning techniques (task 667010).

Analytical and statistical techniques are applied to problems in atmospheric dynamics to select the most promising techniques and assessing their limitations (task 2310G2), acquire, navigate and archive selected samples of digitized satellite imagery data, correct data for various systems errors and analyze data in conjunction with other meteorological data (task 667008), test and improve a prototype modular automated weather system (MAWS) using data acquired at the AFGL Field Weather Test Facility (667010).

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0017, DATA ANALYSIS OF SCATHA BEAM OPERATIONS
H.A. Cohen, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF583210)

AF function - satellite communications and survivability. Deficiency - electrical charging of satellite at geosynchronous altitudes by ambient particles causes anomalous switching of electronic circuitry which reduces reliability and lifetime. Objective -determination of active charging and discharging characteristics of electron and ion charge ejection systems aboard the SCATHA satellite. How research contributes - will provide insight into the ability to control spacecraft charging using charge injection systems. This could lead to incorporation of active control systems on satellites which are potentially susceptible to severe degradation due to electrical charging.

Data from in-house testing and testing to be performed at the SCATHA satellite integrator's facility will be analyzed to determine checkout and initial modes of operation of the SCATHA charge ejection systems. Data from initial operations of the SCATHA charge ejection systems will be analyzed to determine subsequent operations which will maximize future data in terms of determining the optimal method of controlling spacecraft charging and providing maximum scientific information relating to the geosynchronous altitude plasma environment. All SCATHA data relating to charge ejection system operations will be analyzed in support of the SCATHA mission objectives of understanding causes and cures of spacecraft charging at geosyncronous orbit altitudes.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0018, LOWER ATMOSPHERE REMOTE SENSING ASSESSMENT
D. Fitzgerald, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF582950)

AF function - low altitude aircraft operations. Deficiency - unexpected low level turbulence and wind shear effects can adversely affect flight safety and mission performance. Objective - to investigate methods for obtaining improved precision in measurement of low level wind parameters and temperature-humidity profile anomalies. How research contributes - advances in measurement will lead to better warnings of hazardous landing conditions and to improved support for near surface operations.

A detailed analysis will be made of the conditions of applicability of all identifiable low altitude remote sensing techniques. Inputs to the analysis will consist of published reports and engineering data combined with site visits to organizations actively engaged in the construction and use of equipment for remote sensing. Present operational experience regarding the utility and limitations of the various techniques will be determined. Approaches for further improvements in sensor performance will be identified and recommendations made for future lines of development of the most promising techniques.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0019, MEASUREMENTS OF STRATOSPHERIC TURBULENCE OVER WATER
R.E. Good, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF582820)

AF function - provide data to predict if there is a significant change in the environmental quality of the stratosphere as a result of flight of USAF aircraft and missiles. Deficiency - existing data on stratospheric transport is insufficient to accurately predict changes in stratospheric composition from small perturbations caused by aircraft and missile exhaust products. Objective - conduct and analyze balloon-borne observations of the characteristics of turbulence layers. How research contributes - measurements of the turbulence characteristics over level terrain, away from mountains will be compared to previous measurements over mountains. This data will then be used to derive representative mixing coefficients and stratospheric pollution residence times over the United States. This will result in more precise environmental impact assessment of AF flight operations.

A balloon platform is used to carry a corona turbulence sensor that measures the intensity and spectral characteristics of turbulence layers. The balloon will initially be allowed to rise to 90,000 ft. producing a vertical record of the location of turbulence layers. The balloon will then be forced to descend so to float in a turbulent layer for several hours to observe the time history of the turbulent layer. This will be repeated several times during the estimated ten hour mission. A total of two balloon flights are planned with launches from Florida flying across the Gulf to Texas and launch from Chico, CA, flying over the Pacific. Additional turbulence measurements will be performed using the recently developed smoke puff generator. These flights will be conducted at HAFB to thoroughly evaluate the new procedure.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0020, MM RADIOMETER IMPROVEMENT
D.A. Guidice, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580840)

AF function - communications and surveillance. Deficiency -techniques to forecast the proton energy spectra of solar flare-bursts require sensitive mm-wavelength observations. Present mm instrumentation (35 gHz) at Sagamore Hill is below state-of-the-art, a 35 gHz radiometer was not included in current RSTN equipment. Objective - to upgrade the Sagamore Hill mm-wavelength patrol equipment to improve sensitivity, this will then serve as the baseline for other RSTN units as needed. How research contributes - equipment upgrading and resulting improved sensitivity will lead to a more complete utilization of collected data for prediction.

The approach is to investigate the suitability, procure, test, and incorporate wide-band (greater than 100 mhz) intermediate-frequency components into the Sagamore Hill mm-wavelength radiometric instrumentation. Sensitivity will also be improved by incorporating suitable low-noise and/or low-loss waveguide components into the existing radiometer.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0021, PRELIMINARY BEAM-PLASMA INTERACTION STUDIES
J.R. Jaspere, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF583670)

AF function - satellite survivability, communications and surveillance. Deficiency - the characteristics of energetic charged-particle beams injected in the earth's ionosphere and magnetosphere are not understood well enough to assess the space-environmental effects produced by such beams. Objective - to develop knowledge of the injection, propagation, reflection and deposition of energetic electron beams in the earth's ionosphere and magnetosphere. How research contributes - will provide an understanding and review of the literature in the field and a recommendation of specific areas requiring further study.

The data and pertinent literature in the field will be surveyed. In an attempt to understand the data, preliminary calculations will be performed. Directions for future analytical work will be determined.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0022, NONLINEAR INVERSION ALGORITHM FOR SATELLITE-SENSED TEMPERATURE RETRIEVAL
J.I. King, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF583090)

AF function - weather surveillance and forecasting, enhancement of probing techniques, weapons delivery. Deficiency - inability to exploit the full atmospheric sensing capability of Defense Meteorological Satellite Program (DMSP) over inaccessible or unfriendly territory. Objective - to develop data analysis and inversion techniques capable of extracting all the information regarding atmospheric structure inherent in the DMSP sounder data. How research contributes - nonlinear inversion accesses only valid atmospheric inferences by dealing solely with DMSP radiance data free from the contamination introduced by subjectively imposed constraints.

Nonlinear inversion has the attractive features of objectivity (no 'first-guess', prognosis, or climatological input is needed) and noise discrimination (data noise is inferred and isolated by the algorithm without smoothing requirements). The fast Laplace transform (FLT) technique will be programmed for real-time inversion of synthesized radiance data. Following that, a scaled transform theory will be developed capable of incorporating empirical atmospheric transmittance into the inversion algorithm.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0023, EQUATORIAL SCINTILLATION MODELLING STUDIES
J.P. Mullen, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580920)

AF function - communications/navigation. Deficiency - signal fading range errors. Objective - to model the scintillation-producing structure of the equatorial ionosphere in order to predict communication satellite outages and errors. How research contributes - develops and tests predictive models of ionospheric scintillation.

Using actual data from Peru, Brazil and Ghana models are constructed and tested to predict SATCOM outages and error rates. Driving parameters are day number, local time, solar and geomagnetic activity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0024, INCREASE CONTROL OF BALLOON VERTICAL MOTION
G. Nolan, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF582760)

AF function - use of balloons to collect aerospace environment data. Deficiency - inability to control balloon descent rates to conform with experimental requirements. Objective - to obtain greater control of balloon descent rates by modification of the gas valve in present use and from flight tests acquire balloon response information. How research contributes - the development of a modified gas valve and information on its ability to program balloon descent rates will enable atmospheric sampling experiments to be conducted more efficiently by ensuring elimination of contamination and the acquisition of required descent rates.

The EV-13 gas valve has only two positions, full open and closed. Modification will provide a range of automatically controlled openings thus giving a higher degree of buoyancy control. This will allow one to counteract, to a degree not now attainable, the complex thermodynamic and aerodynamic effects on the vertical motion of balloons. If the goal of automatic control is not attainable the modification will provide incremental openings by command. Test flight data will determine the usefulness of these concepts and form the basis for new and improved flight procedures and capabilities.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0025, CATEGORIZATION OF SOLAR FLARE EVENTS DURING THE 20TH SOLAR CYCLE
M.A. Shea, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF248910)

AF function - survivability, solar effects on satellite and missile operation, detection, surveillance, and communications. Deficiency -inability to satisfactorily describe and accurately predict solar and precipitating particle events which affect the aerospace environment in which USAF systems operate. Objective - to identify and catalog solar particle events that occurred during the 20th solar cycle. How research contributes - a data base of comprehensive measurements of solar particle events must be acquired for future basic research necessary to improve the accuracy and reliability of the solar proton prediction technique. When the objective of this research is realized, a systematic and comprehensive solar particle event data base will exist from which phenomenology analyses can be undertaken to identify systematic difficulties in the current technique and areas where applied research may result in significant improvements. This research will contribute toward a data base on the solar particle portion of the energetic particle environment.

Energetic solar particle data acquired by both satellites and ground-based sensors for the 20th solar cycle are being acquired and examined for identification of discrete solar particle events detected at one astronomical unit. The primary satellite data from NASA sources are to be processed into standardized usable formats for systematic examination of the data. The following parameters are being identified for each event and for each sensor responding to the event, onset time, time of maximum intensity, magnitude of peak particle flux, and the duration

of the event. These events will be categorized in terms of their possible relationships with various solar phenomena.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0026, SHUTTLE INSTRUMENT DEVELOPMENT
M. Smiddy, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580760)

AF function - surveillance, communications, and shuttle-plasma interaction. Deficiency - inadequate knowledge of the electrical properties of the ionosphere/magnetosphere system and of the interaction of the space shuttle with the environmental plasma. Objective - to design and fabricate instruments for: 1. Determining shuttle charging and current flow - wake and sheath properties. 2. To measure the flux, directional properties of ions and electrons in the energy range 0 to 50 eV. How research contributes - permits improved space vehicle design for communication and surveillance systems. Provides understanding of the dynamical processes in the ionosphere and magnetosphere and contributes to the understanding and solution of current flow problems on the shuttle.

Spacecraft charging monitors and low energy plasma monitors will be developed for flight on the space shuttle. Later, low energy plasma sensors will be designed for sub-satellite flight in the magnetosphere.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0027, NITRIC OXIDE VARIABILITY IN THE MESOSPHERE AND LOWER THERMOSPHERE
W. Swider, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581120)

AF function - communications, surveillance and detection. Deficiency - inadequate knowledge of the nitric oxide concentration in the upper atmosphere. Objective - to provide better information on the distribution of nitric oxide at 80-200 km as a function of time, latitude and solar activity. How research contributes - nitric oxide is important to the ionic structure and is an IR emitter. Improved models of nitric oxide ionization variability at 80-200 km will help communication codes for computing transmission paths/absorption for LF-VHF. Improved models of nitric oxide variability will help also with Air Force IR surveillance and detection capabilities.

Ionic data measured by LKD and groups outside of AFGL will be compared with models developed in-house. Nitric oxide profiles will be derived from the requirement of reaching agreement between the model/models and data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0028, EXPERIMENTAL INVESTIGATION OF OPAQUE MINERAL OXIDES
S.E. Haggerty, University of Massachusetts, Amherst Campus, School of Natural Sciences & Mathematics, Dept. of Geology, *Amherst, Massachusetts* 01002 (EAR78-02539)

This project concerns an experimental investigation of the stability fields of opaque mineral oxides as a function of temperature and oxygen fugacity at a total pressure of one atmosphere. Experiments will be carried out in the system FeO-Fe2O3-TiO2. Experiments will also be carried out using natural mineral assemblages form kimberlites (opaques, silicates, and/or diamond), carbonatites (Mn-rich opaque minerals and carbonates), and Ca-Al-Ti-rich inclusions from the Allende meteorite.

These experiments will provide data that will allow a determination of oxygen fugacities extant during the crystallization of basaltic terrestrial magmas, oxygen fugacities necessary for the preservation of diamonds in kimberlites, and oxygen fugacities present during solar condensation - as represented by the Allende meteorite.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0029, INSTRUMENTATION FOR ACCELEROMETER DENSITY MEASUREMENTS
J.M. Otis, Wentworth Inst. of Technology, Undergraduate School, *550 Huntington Ave., Boston, Massachusetts* 02115 (DF278900; F19628-75-C-0051)

AF function - airborne surveillance and weapons delivery. Deficiency - accurate predictions cannot be made for ephemerides for low altitude operational satellites and missile targeting because of lack of adequate density data. Research - improved accelerometers and rocket instrumentation for accurate density measurements in the 35-140 km altitude range. How research contributes - density data in this altitude range can significantly improve the accuracy of satellite ephemeris and missile targeting calculations. Objective - the object of the proposed work is to upgrade the accuracy of rocketborne techniques and instrumentation used to determine mean model values and extremes of departure about mean values under varying atmospheric conditions. A major portion of the effort under this procurement will be directed toward optimizing sensors and sub-system performance for improved density measurements over the required range. Data from rocket launches will be utilized for progressive evaluation of contract objectives and accomplishments.

Work on this contract will provide a major transition in fabrication and payload integration of new rocket hardware for 10-inch falling spheres in addition to follow-on effort on accelerometers and specialized electronic sub-systems for the standard 7-inch sphere and the hi-ball densitometer. Instrumented rocketborne payloads will be used to determine neutral upper atmospheric density and temperature in accordance with Air Force requirements. Work will include- (a) applied engineering research and development with regard to related rocketborne sub-systems (b) fabrication, laboratory tests and calibration (c) environmental testing to insure payload integrity and (d) field support of rocketborne payloads launched at designated sites.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0030, THE MORPHOLOGY OF STRATOSPHERIC PLANETARY WAVES
A.D. Belmont, Control Data Corp., *8100 34th Ave. S., Minneapolis, Minnesota* 55420 (DF056330; F49620-79-C-0160)

AF function - long range forecasting of meteorology and the state of the ionosphere are required to support flight and communications systems. Deficiency - little is understood of the dynamics of the upper stratosphere and mesosphere. Yet evidence is mounting that planetary wave patterns in that region are precursors of tropospheric changes. Ionospheric/tropospheric coupling, a popular topic, also suggests some interaction with that region of interest. Objective - to determine the planetary wave patterns in the stratosphere (16-55km) during the period 4/70 to 12/76 from satellite radiance data and to diagnose their spatial and temporal variations. Coupling with other layers is not within the scope. Contribution - improved understanding of the stratosphere, aid communications, possibly aid forecasting.

Satellite radiance data will be analyzed using regression techniques and available rocketsondes to determine average temperature in their stratospheric layers eq (3-13km). These spatial and temporarily distributed data will be spectrally analyzed to determine the contributions of wave numbers 1-6.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

5.0031, AIRCRAFT MEASUREMENTS OF PLUME DISPERSION AND CHEMISTRY
W.M. Vaughan, Environmental Measurements Inc., *8506 Delmar Blvd., University City, Missouri* 63124 (68-02-2709; G603A-AA-178)

OBJECTIVE: To acquire the data base necessary for the development of control strategies for the reduction of ambient air concentrations of sulfates and nitrates, EPA will conduct a large scale program of discrete, intensive experimental field studies during the year FY 78-81; the proposed studies are identified by the acronym, STATE (Sulfur Transport and Transformation in the Environment). Air quality simulation models are the expected end product.

APPROACH: The contractor supplied two moving laboratory platforms for plume transport and transformation from the

Cumberland Power Plant in Tennessee. One platform was an instrumented aircraft and the other an instrumented van - Air Quality Moving Laboratory (AQML) - for measurements in the downwind plume.

PROGRESS: The aircraft has sampled and measured SO2, SO4 (continuous and integrated), B scat, NO, NO2, NH4, SF6 (continuous), hydrocarbons over 4 week period involving approximately 100 flight hours. Sampling and measurements were made for SO2 at the surface, SO2 and NO2 aloft by remote sensor (COSPEC), SF6 (continuous) and hydrocarbons. A data report on aircraft measurements was prepared with graphical representations of all continuous measurements, and tabulated values of filter sulfate and nitrate measurements. A report on the AQML results was also prepared, including analyses and discussions of results for selected sampling days. All data from both aircraft and AQML measurements are included in the STATE data bank.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0032, RELATIONSHIPS BETWEEN CERTAIN AIR POLLUTANTS AND VARIOUS METEOROLOGICAL FACTORS

N.M. Reiss, Rutgers the State University of New Jersey, New Brunswick Campus, Agricultural Experiment Station, Dept. of Meteorology, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (0005009; NJ00279)

OBJECTIVE: Examine: The feasibility of making quantitative determinations of average atmospheric concentrations of soluble salts using statistics derived from routine meteorological observations; the feasibility of making quantitative determinations of average oxidant concentrations, using statistics derived from routine meteorological observations.

APPROACH: Atmospheric concentrations of soluble salts will be determined by making use of the fact that these salts, because they change from solid particles to liquid droplets at discrete humidity values, affect the average visibility vs. relative humidity statistics for a given location. Oxidant concentrations will be determined by making use of the fact that days with high oxidants are known to have low visibilities as well. By isolating days of potentially high oxidant concentrations from an examination of historical weather maps, and examining the visibilities that occurred, one can estimate the oxidant concentrations.

PROGRESS: The results of our earlier research efforts, in which we found a highly predictable relationship between visibility and relative humidity, were used to reconstruct visibilities, and hence, particulate mass concentrations at Newark, N.J. back to 1948. Particulate measurements at Newark were begun only about 1966 and earlier data would be useful in establishing baseline values and in elucidating trends. It was interesting to note that, while visibilities at Newark have increased considerably over the years, much of this can be ascribed to humidity decreases caused by extensive nearby landfill operations, rather than to real improvements in air quality. Beginning in the late 1960s, however, there seems to have been some real improvements in air quality.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative Research Office, New Jersey

5.0033, NATURAL INFRASOUND COMPARED WITH ARECIBO INCOHERENT BACKSCATTER TO MONITOR THE LOWER THERMOSPHERE

D. Rind, Columbia University, Lamont Doherty Geological Observatory, *Palisades, New York* 10964 (ATM78-04587)

This grant funds the establishment of a microphone network near Arecibo, P.R. to record natural infrasound (long period sound waves). The infrasound recorded will be of about 5 sec period and is generated by interfering ocean waves in the seas surrounding the West Indies. Such low-frequency sound travels long horizontal ranges and vertical distances with little attenuation below about 110 km. It propagates beyond line of sight by one or more skips between the upper atmosphere (stratopause region or lower thermosphere) and the earth's surface, being 'reflected' from levels where the speed of sound equals or exceeds that at the surface. The horizontal trace velocity equals the acoustic speed at the reflection level. Because the latter speed is a function of temperature and wind, measurement of the trace velocity provides a useful measure of these atmospheric parameters. Furthermore, the sound amplitude provides information about the wind direction. This work will compare infrasound velocity determination with those computed from (Arecibo) incoherent backscatter observations of temperature and wind, as well as compare winds with those from a meteor wind radar (funded by NSF through a separate grant to Georgia Institute of Technology), thus calibrating such procedure against the others. It will also determine temperature and wind with the infrasound technique by combining its observations with those of backscatter observations of wind and temperature, respectively. From the continuous observation capacity of infrasound it will develop a climatology of lower thermosphere effects at this subtropical latitude.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0034, PHYSICAL AND METEOROLOGICAL CHARACTERISTICS ASSOCIATED WITH THE LIGHTNING DISCHARGE

R.E. Orville, State University of New York, Albany Campus, School of Science & Mathematics, Dept. of Atmospheric Science, *1400 Washington Ave., Albany, New York* 12222 (ATM78-05703)

The objectives of this research are: (1) Record the luminous component of the first lightning stroke during daytime. (2) Record the spectral emissions from lightning channel. (3) Development of a deep convection numerical cloud model for application to the Kennedy Space Center thunderstorms. (4) Analyses of DMSP satellite data to estimate global lightning frequency. (5) Investigate the polarity of cloud to ground lightning discharges.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0035, EVALUATION OF DIFFERENTIAL ABSORPTION LIDAR

R.J. Byer, U.S. Environmental Protection Agency, *Research Triangle Park, North Carolina* 27709 (DF336430)

To evaluate the capability of differential absorption lidar for remote (non-contact) sensing of environmental pollutants generated by Air Force operations. Presently available point monitoring sensors have proven unreliable/inappropriate for determining the contribution of airfield operations to local environmental quality. A DIAL system would provide an integrated pollutant map.

An existing differential absorption lidar (DIAL) system will be used on targets of opportunity to determine the suitability of DIAL measurements for mapping concentrations of pollutants including hydrocarbons and sulfur dioxide. Joint funding with EPA.

SUPPORTED BY U.S. Dept. of Defense, Engineering & Services Center, Engineering & Services Lab.

5.0036, ELECTROOPTICAL TECHNIQUES FOR THE IDENTIFICATION AND CHARACTERIZATION OF AIR POLLUTANTS

W.F. Herget, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab., *Research Triangle Park, North Carolina* 27711 (G712B-BC-032)

OBJECTIVE: Manage, administer, and conduct research programs on the application of electrooptical instruments and systems for the identification and characterization of air pollutants from stationary and mobile sources.

APPROACH: The morphology and elemental composition of particles emitted from sources is determined by transmission

and scanning electron microscopy in conjunction with electron diffraction and microprobe measurements. High resolution infrared emission and long-path absorption spectroscopy, laser-Doppler velocimeter and other remote sensing instruments are used.

SUPPORTED BY U.S. Environmental Protection Agency,
Office of Research & Development,
Environmental Sciences Research Lab.

5.0037, A COMPARISON OF SATELLITE IMAGERY AND CONVENTIONAL AERIAL PHOTOGRAPHY
W.A. Shain, Clemson University, College of Forestry & Recreational Resources, Dept. of Forestry, *Long Hall, Clemson, South Carolina* 29631 (0078326; SC-FR00-041)

OBJECTIVE: A comparison is being made of the effectiveness of satellite imagery and low-altitude color infrared aerial photographs in indicating negative recovery from a severe forest fire and the ability to detect these changes from remote sensing processes.

APPROACH: The subject area (approximately 40,000 acres) has been covered, mapped and analyzed by both aerial photographs and satellite imagery. The Com-Tal plotter was utilized for satellite imagery and standard photo-interpretation techniques were employed for the aerial photographs. When ground truth information is completed, the final analysis will be made.

PROGRESS:

SUPPORTED BY South Carolina State Government

5.0038, ALTITUDE DEPENDENCE OF SPACECRAFT CHARGING
A. Konradi, U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center, *Houston, Texas* 77058 (DF583480)

AF function - surveillance, communication utilizing satellites. Deficiency - satellites are degraded by electrical charge-up induced by the plasma environment. Objective - to determine the variation of spacecraft charging and space plasma as a function of altitude. How research contributes - knowledge of the altitude characteristics of charging will allow an assessment of the importance of spacecraft charging in affecting the overall AF mission in space. It will allow an extension of knowledge gained at geosynchronous orbit to other altitudes.

Data from various satellites available to the NASA Johnson Space Center will be analyzed in order to determine the level of spacecraft charging and corresponding plasma conditions as a function of satellite altitude. Statistics will be gathered on the percentage of occurrence of various potentials at different satellite locations and of the associated plasma conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force,
Geophysics Lab.

5.0039, CONTINUING THEORETICAL INVESTIGATIONS OF PLASMA AND NEUTRAL GAS TRANSPORT PROCESSES IN THE IONOSPHERE
R.W. Schunk, Utah Higher Education System, Utah State University, Center for Research in Aeronomy, *Main Bldg., Office 104, Logan, Utah* 84321 (ATM78-10501)

This grant funds theoretical investigations of the effects that plasma and neutral gas transport processes have on planetary ionospheres and atmospheres. Specifically, this work will: 1) derive diffusion and heat flow equations for a planetary ionosphere which are valid when there are large temperature differences between the interaction species, 2) derive a general system of transport equations which is based upon a bi-Maxwellian distribution function, 3) calculate time-dependent He ion density, temperature, and drift velocity profiles in the polar cap with allowance for heating due to convection electric fields, 4) study the dynamics of the high latitude F-layer with emphasis on understanding the composition changes that occur in the nightside electron density trough regions, 5) study plasma transport in the ionosphere above Stable Auroral Red arcs (SAR arcs) with the complete 13-moment system of transport equations, 6) obtain a numerical solution of the 13-moment of transport equations for the solar wind (H ion electrons) and the terrestrial polar wind (H ion, O ion electrons), and (7) obtain a numerical solution of the 13-moment system of transport equators for the neutral atmosphere.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0040, A STUDY OF ION DYNAMICS AND RELATED EFFECTS AT MIDDLE AND HIGH LATITUDES
J. St. Maurice, Utah Higher Education System, Utah State University, Center for Research in Aeronomy, *Main Bldg., Office 104, Logan, Utah* 84321 (ATM76-82323)

This grant funds a theoretical and data-analysis study of ion dynamics and related effects at middle and high latitudes. In particular, it funds: 1. Continuation of a study of non-Maxwellian ion velocity distributions in regions of fast ion convection at high latitudes, with emphasis on the effects of these non-Maxwellian distributions on measurements. Measurements to be analyzed include retarding potential analyzers and incoherent scatter radar. 2. A study of the dynamics and chemistry of fast convecting regions in the auroral ionosphere, using data from the Atmosphere Explorer satellites. 3. A study of chemical reaction rates, to determine how to interpret laboratory measurements of reaction rates for application to the ionosphere when non-Maxwellian velocity distributions are involved.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0041, DYNAMICS OF LARGE SCALE ATMOSPHERIC MOTIONS
J.R. Holton, University of Washington, School of Arts & Sciences, Dept. of Atmospheric Science, *Seattle, Washington* 98105 (ATM76-84633 A01)

It is proposed to develop numerical models to elucidate a number of features of the large scale circulation in the stratosphere and mesosphere. In particular it is proposed to use the semi-spectral primitive equation model which has been developed with support of NSF grant, ATM-74-21418, to investigate the following topics: (1) The minor warnings or stratospheric 'vacillations' which occur on a quasi-periodic basis during the winter regime in both hemispheres, (2) The role of nonlinear wave interaction during major sudden warming events, (3) The response of the stratosphere to forcing at the tropopause using observed 200 mb geopotential heights as the boundary forcing, and (4) A three-dimensional simulation of the quasi-biennial oscillation including coupling with midlatitude circulations.

In addition, a separate study is planned in which a limited area primitive equation model will be developed to simulate the structure and energetics of tropospheric synoptic waves in the African region during GATE (GARP Atlantic Tropical Experiment).

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0042, STRATOSPHERIC RESIDENCE TIMES FROM CONTRAIL OBSERVATIONS BY SATELLITE
N. Rosenberg, Tel Aviv University, *155 Herzl St., Tel Aviv, Israel* (DF056130; F49620-79-C-0180)

AF function - all aircraft and rockets which operate in the stratosphere (approximately 10 to 50 kilometers altitude) deposit water and other combustion products which might adversely effect the natural composition and chemical balance of that region. Recently, there has been increased concern over the effects upon the stratospheric ozone which absorbs and protects the earth's biosphere from solar ultraviolet radiation. The Air Force is required to submit environmental impact assessment statements on all weapons systems which operate in the stratosphere. The public furor over the SST and B-1 was partially due to the concern over the possibility of zone depletion by engine exhaust gases. Deficiency-the turbulent mixing and larger

scale transport of the natural and man-made chemical species are important factors in modelling of the perturbed stratosphere. Several programs are underway to measure in-situ the concentrations and turbidity. However, little is known of regional values and few statistical models exist for total impact assessments. Objective - this research will investigate the possibility of using LANDSAT satellite images of aircraft contrails to determine stratospheric turbulence coefficients and evaluate the feasibility of using such data to develop a statistical model of eddy diffusivities and stratospheric residence times.

The contractor will search the LANDSAT archives for photos of aircraft contrails, estimate the number of photos required to locate sufficient such images for a second phase study, analyze the best six images located, and by digital analysis, determine radial growth characteristics, the altitude and relationship with known or estimated atmospheric parameters, and derive the eddy diffusivity for the six sample cases. The contractors results will be used to determine the feasibility of the follow-on study.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, E-3A FLIGHT-SIMULATOR (FS) FOLLOW-ON TESTING & EVALUATION PHASE II

W.H. Nelson, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF224270)

Assess the psychological fidelity of the FS. Assess the human factors engineering of the instructional features. Assess the capability of the FS to train the required tasks.

AFHRL/FTR will provide an on-site evaluation of the capability of the instructional features to provide a functional environment for training the flight crew - tasks including AFHRL collection, processing, and analysis of data. AFHRL report will include conclusions, recommendations, and deficiencies. AFHRL/SM support will process computer cards which will be mailed by the test team once per month and will provide tabulated summary descriptive statistics to USAFTAWC/TNX and AFHRL/FTR. AFHRL/FTR will provide quarterly and final analysis summaries to include, but not be limited to, deficiencies and conclusions/recommendations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, PULMONARY GAS FLOWMETER FOR ABNORMAL ENVIRONMENTS

L. Hall, Perkin Elmer Corp., *Pasadena, California* (DF320600; F33615-77-C-0607)

The purpose of this effort is to obtain a bi-directional respiratory flowmeter that will accurately monitor inspired and expired gas flow rates and volumes under dynamic conditions of increasing gravitational forces and varying altitude experienced by aircrew members. Currently available flow meters are either affected by dynamic variation in g forces, pressure, gas density, gaseous species, temperature or humidity. This produces large and unacceptable errors when evaluating environmental stressors on aircrew members. The present procurement contract seeks to overcome these errors by the use of new technology in this area. Use of the flowmeter will provide, more accurately, data on the effects of the stressors met in flight and for establishing biomedical criteria for the design and testing of life support systems.

The contractor shall furnish the necessary personnel, service, equipment and facilities to design, fabricate, test and deliver a pulmonary gas flowmeter for measuring pulmonary function under aircraft flight simulated conditions of changing pressure and gravity fields. The contractor will build a 'breadboard' model which will be tested and approved by USAFSAM before the final model is fabricated, tested and delivered.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0003, AERODYNAMIC/INERTIAL RESPONSE ANALYSIS

P. Payne, Payne Inc., *Annapolis, Maryland* (DF325380; F33615-79-C-0527)

Seven percent of the major injuries that results from emergency escape from military aircraft under noncombat conditions are attributable to aerodynamic forces. Under combat conditions where the ejection velocities are higher, the windblast injury rate has been at least 26 percent. Solution of this problem requires that the escape system designer understand the characteristics of all of the forces that act simultaneously or sequentially on the crewmember during the escape process. The objectives of this research effort are to conduct an analysis of the aerodynamic and inertial forces acting on the human body during escape using available data to provide design criteria for protective equipment design and, where necessary, to improve the analytical methods and design future experimental efforts to substantiate these methods.

The research involves: 1. The consolidation and analysis of all available aerodynamic data on the human body with particular emphasis on extremity flail potential loads, 2. Adapting the consolidated data for use with the AMRL/articulated total body (ATB) model, computer model of an aircrewman's body, 3. Acquiring data on the inertial forces acting on the crewman due to the action of ejection catapults, rockets and aerodynamic decelerators, 4. Exercising the model using both inertial and aerodynamic data in comparison with actual USAF flail injury experience, and 5. Determining what additional experimental information is needed, and planning additional wind tunnel program (or programs) to obtain it.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0004, LDF 79-5, TARGET ACQUISITION UNDER VIBRATION AND HIGH GRAVITY FACTORS

A.P. Ginsburg, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF325220)

The Air Force needs to understand target acquisition under the operationally important conditions of vibration and high gravity (g) forces. Vibration can cause a blurring of the perceived image and discomfort may interfere with observer attention and/or decision processes. High g-stress may also cause similar problems in addition to reduced peripheral vision. A series of experiments is proposed to determine the human spatial filtering properties and investigate the identification of simple and complex targets during vibration and high g-forces. Furthermore, detection and identification thresholds of targets of a stationary observer viewing vibrating targets, for example, on a vibrating display, will also be undertaken. Since the physics of the observer are different under those two conditions, then different results are expected for target detection and identification.

Devices capable of satisfying technical objectives are not commercially available. Presently available variable contrast devices capable of measuring contrast thresholds of objects will not withstand vibration. Thus, a variable contrast device capable of operation under sustained vibration and high g-stress will be created under contract. The initial design concept will be to use a cross Polaroid system that under operator, subject, or computer control, allows the change of contrast of any slide imagery without changing the mean luminance of the stimulus. Base line studies will determine the contrast sensitivity of sine wave gratings and the detection and identification of complex targets, e.g., aircraft, under static viewing conditions. The contrast sensitivity measurements will define the threshold contrast sensitivity of the subject. The data will be related to the detection and identification of complex objects. Next, studies will be made under conditions of vibration and induced high g-forces. The vibration platform and the centrifuge facility at AMRL will be used to create vibration and g-force conditions. The difference between the contrast sensitivity measurements under static and dynamic conditions will provide a quantitative description of visual sensitivity to certain spatial frequencies which in turn will be related to the differences between target detection and identification under those static and dynamic conditions. This

effort is supported by O & M contract documented under work unit No. 71840006.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0005, OPTICAL PROPERTIES OF WINDSCREENS
R.C. Seid, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321110)

To develop new measurement techniques for evaluating cockpit windscreen optical characteristics. To measure and quantify the optical characteristics exhibited by experimental and actual aircraft windscreens, using both existing and new optical measures. To analyze the optic performance of the design windscreens for the F-111 using computer ray-tracing techniques, assist in relating the optical characteristics of these, and similar, transparencies to specific functional effects on the human visual system (work unit 71841803). The ultimate product of this work unit will be to recommend a specific set of optical measures that will be used in acceptance testing of aircraft windscreens.

Historically, a number of optical tests have been devised in an effort to quantify the optical characteristics of windscreens. None of these measures has proven to be infallible. In the previous work unit (71841204) several new measures of windscreen optical quality were being explored. These included: multiple imaging, optical Fourier analysis, angular deviation, binocular disparity and birefringence coloration. By comparing optical measures made on the windscreens with pilot acceptance and/or visual performance (see work unit 7184-18-03) it will be possible to determine which of these optical tests correlates with vision. Predistorted panels have been fabricated to be used in relating optical measures to vision. Windscreens and new panels having different characteristics and geometrics will be used during the course of this work. The windscreen measurement lab and the image metrics facility will be used in accomplishing this work. Disciplines involved are optics, physics, and experimental psychology. Field data from F-111 windscreens will be obtained and compared with the optical measures developed for the previous work unit. Computer ray trace of the F-111 windscreen will be accomplished for determining design-inherent angular deviation, binocular disparity and multiple imaging. This will be compared with actual measures to determine how much of the problem is due to manufacturing and how much is inherent in the design.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0006, USE OF THE C-5 A/C GROUND PROCESS SYSTEM FOR PROTOTYPING AUTOMATED MAINTENANCE SYSTEM APPLICATIONS (AMS) TEST PROGRAM
E.G. McFall, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF228320)

To modify the ground processing system (GPS), an advanced maintenance management system unique to C-5 aircraft, to incorporate twenty-two new maintenance management concepts, primarily in automation/distribution of existing maintenance forms and automated parts ordering. The changes will be incorporated incrementally into the GPS. An evaluation will be performed to determine the effectiveness of these changes in reducing administrative workloads, increasing visibility of management information and increasing overall operational effectiveness. Additionally, the modified system will be compared against a non-GPS maintenance system to enable evaluation for Air Force wide application. The specific objective of AFHRL's participation is to evaluate these concepts from a human factors standpoint (e.g., ease of use, confidence in system, training requirements) and to provide consultation in the design and execution of the overall evaluation.

New concepts will be implemented incrementally into the basic GPS and evaluated on the basis of operational impact and human factors. AFHRL will concentrate on the human factors investigation, to be accomplished by: (1) assisting in task analysis, (2) identifying human factors evaluation areas, (3) developing job tests and data collection forms, (4) monitoring data collection, (5) analyzing human factors data, and (6) reporting findings. Manpower engineering teams will be the primary data collectors for both the human factors data, and the operational system evaluation data. To insure a valid assessment of change impact (resulting from automation), to be projected for other GPS and non-GPS applications, it is necessary to measure the same tasks in a similar but non-GPS system. The McGuire AFB, C-141 maintenance organization has been selected for this purpose. This effort will begin in February 1977 with evaluation of present system. Analysis and development of the proposed system will be accomplished as implemented by MAC. Total evaluation will be completed by January 1980. More detailed milestones can not be specified at this time. They will be specified as the effort progresses.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0007, EVOKED CORTICAL RESPONSES AS AN INDICATOR OF G TOLERANCE
M.M. Cohen, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881699)

To determine whether evoked cortical responses to visual stimuli can provide an objective, quantitative, reliable, and non-invasive indicator of human tolerance to g3 acceleration loads.

Changes of visual function such as decreased visual sensitivity, dimming of the visual field, peripheral light loss (PLL) and central light loss (CLL) have been shown to preceed the loss of consciousness (LOC) that can result when human subjects are exposed to excessive gz acceleration loads. Both the visual changes and the LOC are due to inadequate blood supply to the eyes and brain resulting from acceleration produced hydrostatic pressures in excess of cardiovascular capacities. Although Doppler flow techniques can provide objective indications of flow velocity, these techniques are sensitive to straining maneuvers on the part of the subject, and the resulting artifacts can make the interpretation of Doppler flow signals extremely difficult when the subject is not completely relaxed. In contrast, evoked cortical responses should reflect the integrity of the visual system, irrespective of straining maneuvers. In the proposed experiments, PLL, CLL, Doppler flow measures, and evoked cortical responses will be recorded and studied while volunteer human subjects are exposed to increased gz acceleration loads, both when the subjects are relaxed and when they perform L1 and M1 straining maneuvers. Changes in the evoked cortical responses will be correlated with the other physiological and behavioral parameters, and the efficacy of evoked cortical responses as an indicator of gz tolerance will be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

6.0008, ANALYSIS OF CAREER MOTIVATION-CAREER POTENTIAL INDEX
E. Boyle, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Lackland Air Force Base, San Antonio, Texas* 78236 (DF233720)

The objectives of this effort are as follows: (1) to develop a data base for a longitudinal study of career motivation, (2) to determine changes in career motivation during first-term and the reasons for those changes, (3) to identify factors related to positive career motivation, and (4) to explore the feasibility of developing a career potential index.

A large sample (approx 30,000) of NPS airmen will be administered a biographical/attitudinal survey at the 12, 24 and 36 month points of their initial tour. Distribution and regression analyses, and chi square analyses will be accomplished to track career motivation and predictability of career intent/career decision.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0009, EVALUATION OF ITEM CHARACTERISTICS CURVE THEORY TO REDUCE BIAS AND INCREASE VALIDITY

H.E. Jensen, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Brooks Air Force Base, San Antonio, Texas* 78235 (DF234180)

Greater accuracy in estimating airmen ability levels through the use of an adaptive testing method and latent trait theory.

Approximately 1000 word knowledge and arithmetic operations items will be calibrated, obtaining the A, B, and C parameters. Items selected for inclusion in the adaptive test will demonstrate minimized racial bias. Tests will be administered to approximately 400 basic airmen who are designated for the 423, 426, and 431 career fields. Final school performance measures will be obtained and conventional and adaptive test scores will be correlated with these.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0010, PERIPHERAL CUES AND COLOR IN VISUAL SIMULATION

C.L. Kraft, Boeing Co., *7755 E. Marginal Way S., Seattle, Washington* 98124 (DF054180; F49620-79-C-0030)

AF function - this research supports AF programs in aircrew training, particularly the flight simulator procurement program. Deficiency - the prudent procurement and use of expensive flight simulators requires knowledge about pilot visual processes, such as the types of peripheral cues needed to learn the landing task and the effect of color on this learning. Currently there is a deficiency in our knowledge about how these visual processes interact with learning complex tasks. Objective- this research will provide quantitive data on the effect of scene content complexity, color, and visual field on USAF pilot performance in the approach and landing phases of the operation of a very large aircraft. How research contributes - the results of this study should permit intelligent decisions to be made about the types of color and complexity needed in computer generated imagery visual scenes and the necessity of peripheral cueing displays (side windows) for student pilots.

A group of AF multi-engine pilots will be given a complete optometric examination and a series of special visual tests to evaluate stereo acuity, chromostereopsis, chromatic interval, and cyclophoria. They then will fly a number of approach and landings in a multi-engine aircraft simulator under various conditions of scene complexity, color and peripheral cueing. Performance ratings will be collected by expert judges as well as objective flight parameter algorithms. Data analyses will compare pilot performance under the different conditions of simulation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, HYDRODYNAMIC STUDIES OF THE NOVA OUTBURST AND RELATED OBJECTS

S.G. Starrfield, Arizona State University, School of Liberal Arts, Dept. of Physics, *Tempe, Arizona* 85281 (AST77-23190)

This research will be concerned with the cause and evolution of the nova outburst. Calculations will be made concerning the behavior of the material that is ejected from the star and the effect of accretion of material on the characteristics of the nova outburst. Thermonuclear reactions in the envelopes of neutron stars will be studied in an attempt to understand the transient X-ray sources that have been observed. Accretion of material onto neutron stars will be examined. There will be work concerned with the cause of the nova outburst and a study will be made of the effects of variations in the helium to hydrogen abundance ratio on the nova and dwarf nova phenomenon. An investigation of oscillations of novae will be made.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

8.0002, SOLAR OSCILLATIONS

H.A. Hill, University of Arizona, School of Liberal Arts, Dept. of Physics, *Tucson, Arizona* 85721 (DF248760; F19628-77-C-0064)

AF function - communications, surveillance, detection, tracking. Deficiency - extremely limited knowledge of solar interior structure. Objective - determine the nature of possible solar oscillations and construct solar interior models based on these results. How research contributes - a detailed knowledge of solar interior structure is needed before accurate models capable of predicting the behavior of solar magnetic fields may be constructed.

Continue observations of solar oscillations with periods between ten and fifty minutes. Based on the derived amplitudes and frequencies of these oscillations solar interior models will be constructed. These models can then be used to investigate the origin of solar magnetic fields.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

8.0003, CHATANIKA INCOHERENT-SCATTER FACILITY OPERATION AND COORDINATION

M.J. Baron, S R I International, Radio Physics Laboratory, *300 Ravenswood Ave., Menlo Park, California* 94025 (ATM72-01644 A06)

This grant funds the operation of the Chatanika Incoherent-Scatter Radar facility in Alaska for research into the quiet and disturbed auroral-zone atmosphere and ionosphere by the U.S. scientific community. Scientific questions to be explored include: 1. electron and ion densities and temperatures during quiet times and during times of auroral electron and proton bombardment, 2. behavior of the auroral-zone ionosphere during times of solar proton events, 3. winds and dynamical effects in the E- and F-regions, 4. relationships of observed phenomena in the auroral-zone ionosphere to geomagnetic variations, visible and infrared light emissions, and gravity and infrasonic wave activity.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0004, INHOMOGENEOUS AND ANISOTROPIC SYSTEMS

D.W. Hone, University of California, Santa Barbara Campus, School of Letters & Science, Dept. of Physics, *Santa Barbara, California* 93106 (DMR78-05926)

Research previously supported by DMR7302691.

Theoretical research in condensed matter physics will be carried out. The types of materials which will be studied will include lower dimensional magnetic crystals, pure and impure exchange coupled paramagnets, and surfaces. A major motivating factor will be the direct comparison with experiment, such as the interpretation of proton spin-lattice relaxation in tetramethylammonium manganese chloride in terms of a symmetry crossover phenomenon. The work on surfaces will be focussed on exploring charge exchange scattering and related problems on the charge states of protons driven through thin films of atoms sputtered from surfaces. Also, resistance fluctuations in thin metal films and inelastic electron tunneling will be studied. Continuing investigations of correlated atomic motion in high temperature paramagnets and superionic conductors will be pursued.

This research program is aimed at increasing our understanding of the behavior of a wide range of phenomena in a number of technologically interesting materials.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0005, THEORETICAL PARTICLE PHYSICS AND THEORY OF PHASE TRANSITIONS

M. Nauenberg, University of California, Santa Cruz Campus, Crown College, Dept. of Physics, *Santa Cruz, California* 95064 (PHY78-22253)

This work is in the field of theoretical physics, with emphasis on problems in statistical mechanics and elementary particle physics. In particle physics, the topics include the study of topological properties of the non-abelian gauge theories, models of quark confinement in both lattice and continuum approximations, and phenomenology of hard proton scattering. In statistical mechanics, the renormalization group will be applied to various phase transitions, such as spin glass transitions which have not yet been fully understood. Finally, problems in high-energy astrophysics relating quantum field theory and general relativity will be pursued.

This is the first year of a three-year continuing grant, previously supported under NSF grant PHY76-18598A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0006, THEORY OF STRONG CONFIGURATION INTERACTION IN ATOMIC TRANSITION

T. Chang, University of Southern California, School of Letters Arts & Sciences, Dept. of Physics, *3551 University Ave., Los Angeles, California* 90007 (PHY78-09621)

A program of research in theoretical atomic physics will be initiated. This project is designed to develop a realistic theoretical approach for atomic transitions in metal atoms. The main effort will be concentrated on the study of autoionization processes which are dominated by the strong configuration interactions corresponding to the two-particle excitations. Special attention will also be given to the atomic transitions in ionic systems where accurate experimental measurements are either extremely difficult or practically inaccessible at the present time. The basic approach in this work is to extend and generalize Professor Chang's recently developed theoretical procedure which has already shown to be particularly effective in dealing with other important many-body interactions (or, equivalently, the configuration interactions) including the ground state configuration interactions, the intershell and interchannel interactions. The infinite number of configurations which contribute to the strong configuration interactions will be replaced by a finite number of configuration channels. The configuration interactions are then effectively taken into account by the coupling of these configuration channels in terms of a set of coupled differential equations similar to the ordinary Hartree-Fock equation which can be evaluated readily with existing computational techniques.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0007, HEAT PULSE STUDIES IN HELIUM AT LOW TEMPERATURE

J.U. Trefny, Colorado School of Mines, Graduate School, Dept. of Physics, *Golden, Colorado* 80401 (DMR77-25715)

Heat pulse experiments will be conducted in solid, liquid and gaseous helium at low temperature. An experimental study will be made of pulse-generated second-sound in solid helium-three and in helium-four rich mixture of helium-three and helium-four. Measurements, with improved temperature control, will be made of pulse driven first sound in gaseous helium-four, helium-three and helium-three and helium-four mixtures.

This is a continuation of research supported under DMR7202941 at Wesleyan University.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0008, LIGHT SCATTERING STUDIES OF SPIN-FLIP PROCESSES IN SEMICONDUCTORS AND OF ANOMALOUS PHASE TRANSITIONS IN INSULATORS

J.F. Scott, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Physics & Astrophysics, *1200 University Ave., Boulder, Colorado* 80302 (DMR78-02552)

Experimental studies of Raman scattering in solids previously supported by DMR76-04561 will be continued. Spin-flip scattering experiments will be carried out on the wide bandgap semiconductors ZnTe:As, ZnTe:Li, SiC:Al; and SiC:N. Emphasis will be given to measuring the dependences of the transition intensities and linewidths as a function of concentration near the Mott transition. Raman studies of dynamics of the second order phase transitions in BaMn1-xCoxF4 also will be done. Related structural studies will be carried out for ‘(bP5O14 and Eu2SiO4. Three new effects will be emphasized in these studies: 1) ferroelectrically induced magnetism; 2) large dielectric anomalies proportional to sublattice magnetization near the critical temperature; and 3) anomalous acoustic phonon dispersion at incommensurate transition temperatures.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0009, RADIATION EFFECTS AND POINT DEFECTS IN INSULATING CRYSTALS

R.B. Murray, University of Delaware, School of Arts & Sciences, Dept. of Physics, *Newark, Delaware* 19711 (DMR76-08550 A01)

Experimental studies of the interaction of energetic charged particles with insulating crystals which were supported by NSF grant DMR-7608550 will continue. These studies are directed toward providing an understanding of radiation damage mechanisms, the processes by which defects recombine and the electronic processes that accompany defect formation in insulating crystals. Optical experiments will be used to study positive ion irradiation effects in potassium chloride and magnesium oxide. The effects to be investigated include ion track effects and defect recombination in potassium chloride. The damage dependence of the range for helium ion penetration also will be measured.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0010, CRYSTAL-FIELD EFFECTS IN MAGNETIC SYSTEMS

Y. Wang, State University System of Florida, Florida State University, School of Arts & Sciences, Dept. of Physics, *205 Wildwood Dr., Tallahassee, Florida* 32306 (DMR77-21539)

The advancement in experimental techniques in recent years have made the detailed measurement of crystal-field effects in a magnetic system possible which in turn demands a refined theoretical treatment. The development of accurate theoretical methods in treating magnetic systems where the crystal-field plays an essential role will be carried out. Examples of the physical systems are the rare earth compounds, especially the induced moment systems with singlet or nonmagnetic doublet ground states. Two methods will be used to study the crystal-field effects in these compounds. A Green's function theory which incorporates the correlations of fluctuations in a systematic procedure will be applied to the induced moment systems. The theory is expected to explain the line broadening in neutron scattering experiments, the behavior of the central mode, and the thermodynamic quantities such as magnetization, susceptibility, specific heat, and the critical temperature.

This is a continuation of research supported under DMR7302318.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0011, THEORY OF COMBINED SYNCHROTRON, CERENKOV, AND TRANSITION RADIATION
W. Tsai, University of Miami, School of Arts & Sciences, Dept. of Physics, *Miami, Florida* 33124 (PHY78-01305)

A program of research in theoretical physics will be initiated to improve our understanding of electromagnetic radiation processes. Even though synchrotron, Cerenkov, and transition radiations are well known and have been extensively studied in the past, the importance of their combined effects has not been recognized until recently by Tsai and his collaborators. The new features emerging from the interference among these radiation processes can be applied to the study of plasma physics, solid state physics, astrophysics, as well as to the design of new high energy counters. Theoretical effort is needed to provide guidance for the design of experiments to exploit these new efforts.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0012, PLASMA VORTEX STRUCTURES
D.R. Wells, University of Miami, School of Arts & Sciences, Dept. of Physics, *Miami, Florida* 33124 (PHY77-07106 A01)

The research project in plasma physics is concerned with the study of naturally occurring, self-ordering stable plasma structures. These structures are investigated theoretically and experimentally. The theory is concerned with an application of variational principle and the use of appropriate constraint integrals which correspond to the physics of the experiment. The total 'free' energy of the plasma structures is varied subject to these constraints in order to find the most stable plasma configurations. The determination of appropriate and complete sets of constraints for various situations is of current interest. The resulting equations of motion for the plasma are compared to experimental results.

The particular plasma structures currently under investigations are generated by conical theta pinch guns. The resulting plasma vortex structures are guided to the center of a primary magnetic mirror. They are then compressed and amplified by adiabatic compression, utilizing a secondary magnetic mirror system. Various plasma diagnostics are used to determine plasma temperature before and after compression. Secondary compression by magnetic vacuum fields as high as 120,000 Gauss is currently under investigation.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0013, A COOPERATIVE RESEARCH PROGRAM IN ELECTRON SPECTROSCOPY OF ATOMIC COLLISIONS IN SOLIDS AND GASES - THEORY AND EXPERIMENT
M.G. Menendez, University of Georgia, Franklin College of Arts & Sciences, Dept. of Physics, *Athens, Georgia* 30601 (INT77-01314)

This award provides support for three U.S. scientists to visit Argentina to conduct research in cooperation with Argentinian scientists using the facilities of the Bariloche Atomic Center in San Carlos de Bariloche, Argentina. Under the U.S.-Argentina Cooperative Science Agreement the Argentinian Government is also providing funds for the purchase of equipment to be used in this cooperative effort and for a visit by Argentinian scientists to the U.S.

In this project the scientists will study doubly differential cross-sections of the secondary electrons emitted when beams of ions or atoms collide with solid and gaseous targets and the ionizations caused in the targets by the bombarding beams. Secondary electrons are emitted by the target when it is struck by a beam; they are important in vacuum tubes, cathode ray tubes, space probes and other devices. The ionizations caused in target by a bombarding beam are of importance in atmospheric models, particle detectors, and radiation damage in living tissue.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0014, DEVELOPMENT OF SCANNING PROTON MICROSCOPY
R. Levisetti, University of Chicago, Graduate School, Dept. of Physics, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (PCM77-00464 A01)

A 65 keV, low resolution (approximately 1000 A) scanning transmission ion microscope (STIM) with a hydrogen ion beam from a field ionization source has been developed. Several of the anticipated new imaging methods based on ionic interaction have been qualitatively but successfully explored. We wish to pursue the development, in a balanced approach between technological advance and a systematic program of study of the ion beam-specimen interaction. Future plans include: a) A systematic program of measurement of qualities relevant to the understanding of the image contrast based on ionic interactions. Use of a magnetic spectrometer will enable the separate detection of the dark-field signals originating from proton-electron recombination (charge-exchange) and H2 ion dissociation used here as image contrast mechanisms. Emphasis in such studies will be on exploring the potential of the STIM in providing useful contrast related to chemical composition, of light elements in particular. b) To improve the resolution of the STIM. This will first be attempted using the gun-microscope presently available by reducing the beam aperture to the limit allowed by the field ion source brightness (resolution estimated at approximately 300 A). Secondly, a system already designed of einzel electrostatic lenses will be introduced in the optical column (resolution limit estimated at 50-100 A). The program endeavors to isolate those sources of image contrast which are unique to the interaction of a proton versus an electron probe. Significant application of the new instrument to biomedical and biological research is anticipated in particular to complement electron microscope observations with the anticipated unique sensitivity of the STIM to the hydrogen content in thin specimens.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Biological Behavioral & Social Sciences, Div. of Physiology Cellular & Molecular Biology

8.0015, DEFECT INTERACTIONS IN CRYSTALS
A.V. Granato, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (DMR77-10556 A01)

This research was previously supported under DMR 75-14726.

The main focus of this research is the investigation of dislocation-point defect interactions and the influence on these interactions of electrons, phonons and optical illumination. Ultrasonic attenuation will be studied in a variety of crystals in order to measure the nature of these interactions. Among the systems which will be investigated are (1) carbon in iron, (2) free interstitials in metals, (3) defects in irradiated metals and (4) impurity-interstitial complexes. The strength loss of superconductors and the strength increase of II-II compounds under optical illumination will be studied by means of ultrasonic measurements.

The development of theories to explain these effects will be continued. In particular, this will include the theory of long-range dislocation-point defect interactions and the effect of thermal fluctuations on amplitude-dependent internal friction.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0016, ULTRASONIC STUDIES OF MAGNETIC-FIELD DEPENDENT INTERACTIONS IN METALS
J.R. Franz, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Physics, *Memorial Hall, Bloomington, Indiana* 47401 (DMR77-11160 A01)

An ongoing program of ultrasonic studies of magnetic-field dependent interactions in metals will be continued. New experimental techniques of very high sensitivity that have recently been developed will be used to investigate a wide variety of phenomena. Nuclear acoustic resonance experiments in dilute magnetic alloys will be carried out to detect and analyze satellite resonances caused by the interactions between the impurities and their near neighbors. Such experiments can be used to determine the electric field gradient and the net electron spin density at sites near the impurities. Small velocity shifts resulting from the nonresonant Alpher-Rubin interaction will be measured in Al over the temperature range 4-77 K and in magnetic fields up to at least 100 kG to investigate the onset of band structure effects, to look for effects of magnetic breakdown, and to try to understand anomalous phase reversals that have been observed in nuclear acoustic resonance experiments. Experiments will be carried out in tantalum to test the dependence of the Alpher-Rubin interaction on magnetoresistance. A nuclear acoustic resonance investigation of anisotropic Knight shifts in pure metals will also be done. Experiments are planned for both cubic and noncubic metals as well as studies of small velocity shifts in super-conductors.

This is a continuation of research supported by NSF grant No. DMR75-14355.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0017, THEORETICAL STUDY OF FUNDAMENTAL PROCESSES IN CONDENSED MATTER

W.L. Schaich, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Physics, *Memorial Hall, Bloomington, Indiana* 47401 (DMR78-10235)

Research previously supported by DMR76-20034.

Theoretical research of fundamental processes in condensed matter will be carried out. Those areas to be investigated will include: (1) Electromigration. The theory will be extended in order to clarify questions of principle and to make it more quantitative. (2) Dispersion forces. The Lifschitz theory will be examined in the retardation regime in an effort to remove the current discrepancy between theory and experiment. (3) Surface reaction dynamics. The Brownian motion model will be used to further the understanding of desorption spectra. (4) Phonon transport. In order to understand the experiments in this field, theories will be developed to include the frequency-dependent effects of ballistic versus diffusive motion of phonons in crystals.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0018, NEW METHOD FOR INFRARED DETECTION

J. Weber, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics, *College Park, Maryland* 20742 (ENG77-28458)

A new method for detection of electromagnetic radiation in the far infrared portion of the spectrum is being investigated. Free electrons in the surface layers of a conductor are employed to coherently scatter infrared photons into the microwave region. The requirements for conservation of energy and momentum require the scattering to take place in a magnetic field inside of a superconducting shield at cryogenic temperatures. The new approach is promising for the wavelengths region from 1 millimeter to 100 microns. Detectors based upon this principle would prove useful in radio astronomy and communications.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Engineering & Applied Science

8.0019, AXISYMMETRIC SOLAR WIND THEORY

R.L. Carovillano, Boston College, Chestnut Hill Campus, School of Arts & Sciences, Dept. of Physics, *140 Commonwealth, Chestnut Hill, Massachusetts* 02167 (ATM77-11690 A01)

This grant will support a study of axisymmetric solar wind theory. The basis for the work is a new equation governing axisymmetric ideal magnetohydrodynamic (MHD) flow. The purpose of the work is to extend the analysis of the equation, to obtain analytical solutions, and to develop applications to the solar wind. Areas to be studied include: critical surfaces, mathematical properties of the equation and its solutions, analytical solutions, the variational principle from which the equation is derivable, perturbation theory, propagation of disturbances, the relativistic generalization of the equation, and applications to solar research such as coronal holes and the heliosphere.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0020, SUPERGRAVITY, GENERAL RELATIVITY AND FIELD THEORY

S.J. Deser, Brandeis University, School of Arts & Sciences, Dept. of Physics, *415 South St., Waltham, Massachusetts* 02154 (PHY78-09644)

Research in theoretical gravitation and field theory currently supported under NSF grant PHY76-07299 A01 will be continued. A major effort will be directed toward a deeper understanding of the new subject of supergravity. This theory attempts to unify the treatment of space, time, and matter into a single entity. Among the topics to be investigated are: 1. Supergravity; 2. Vector gauge fields; 3. Solitons; 4. Quantum gravity; 5. Classical gravity.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0021, ENERGETIC PARTICLES AND MAGNETIC ACTIVITY

P.M. Hagan, Emmanuel College, Graduate School, Dept. of Physics, *400 the Fenway, Boston, Massachusetts* 02115 (DF582660; F19628-79-C-0102)

AF function - communications, surveillance and navigation. Deficiency - lack of understanding of magnetosphere and inability to predict solar particle effects on atmospheric and ionospheric conditions. Objective - define the charged particle population and magnetic field configuration in the interplanetary medium and the earth's magnetosphere developing models and characteristic indices.

Design, develop and fabricate hardware modifications for the AFGL magnetometer network interfacing hardware with system software and with the data processing programs to provide increased system reliability and ease of utilization. Design and fabricate hardware to measure energetic particle fluxes, to discriminate species and to perform energy analysis. Match instrumentation to available satellite rides performing integration and calibration as required. Analyze data returned or recovered emulsion packages and perform payload simulation studies to verify observed results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

8.0022, TESTS OF THEORIES OF GRAVITATION

G.H. Pettengill, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (PHY78-07760)

Research in solar system observations about gravitational physics supported under NSF grant PHY72-05104 A05 will continue. Among the topics to be investigated are: 1) Perihelion advance of planetary orbits; 2) Principle of equivalence; 3) Test of possible time dependence of the gravitational constant; 4) Model of solar system - planetary topography, orbit of Jupiter, asteroids.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0023, PARTICLE THEORY

R. Arnowitt, Northeastern University, School of Liberal Arts, Dept. of Physics, *360 Huntington Ave., Boston, Massachusetts* 02115 (PHY78-09613)

The proposed research is in the field of the theoretical physics with emphasis on attempting to understand the interactions of elementary particles. Specific projects will be pursued in the areas of: Local Supersymmetry - The co-principal investigators propose to continue their investigation of unified gauge theories based on local supersymmetry. Research would involve the following topics: 1. An investigation of the particle content of gauge supersymmetry. 2. Examination of whether the Bianchi identities of the theory lead to a consistent treatment of higher spins. 3. Examination of particle phenomenology in the 'low' energy region (2 less than or approximately 10 to the 8th power GeV) arising from gauge supersymmetry. 4. Discussion of quantum loop corrections. 5. Examination of the k yields O limit of gauge supersymmetry and its relation to supergravity. 6. Discussion of non-perturbative methods for calculation of quantum corrections. Quantum chromodynamics - 1. Dynamical examination of instanton-meron phenomena and quark confinement. 2. Investigation of non-perturbative approximation to QCD (such as Hartree-Fock) which satisfies the non-Abelian Ward identities.

This work is a continuation of that currently supported under NSF grant PHY 76-11455 A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0024, X-RAY SCATTERING FROM QUANTUM FLUIDS AND GASES

R.B. Hallock, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Physics, *Amherst, Massachusetts* 01002 (DMR77-07727 A01)

This research is a continuation of work done under DMR-7508630.

The static structure factor, S(K), of the quantum fluids helium-3 and helium-4 will be determined by X-ray scattering techniques. S(K) will be determined as a function of density at fixed temperature and as a function of temperature at fixed density. Specific goals are the testing of theoretical predictions for spatial ordering effects associated with the superfluid phase transition at T in helium-4. Work will be initiated for the gas phase of helium and accurate pair correlation functions will be determined for the first time.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0025, DESIGN, CONSTRUCTION, AND TESTING OF A SUPERCONDUCTING CYCLOTRON FOR HEAVY-ION RESEARCH

H.G. Blosser, Michigan State University, School of Natural Sciences, Dept. of Physics, *243 Natural Resources Bldg., East Lansing, Michigan* 48824 (PHY76-83254 A02)

This work is the logical continuation of the work in progress under NSF grant PHY75-01080 A02 consisting of the design and construction of a superconducting magnet with an azimuthally varying field and very high field strength. The high field (5 Tesla) will be accomplished by using superconducting wire in the coils. The object of the project is to produce a high-field magnet of sufficiently high quality to serve as the main magnet of an isochronous cyclotron. The magnet was designed to be full scale, allowing it to serve as the basis for a complete cyclotron if the specifications were met.

This grant will extend the feasibility study to the design and construction of the necessary subsystems (RF acceleration voltage, ion source extraction system, etc.) to make a functioning cyclotron. Sufficient auxiliary equipment will be provided to allow for extensive studies of the use of beams provided by the accelerator as nuclear probes.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0026, POSITRON INTERACTIONS WITH ATOMS AND MOLECULES

W.E. Kauppila, Wayne State University, School of Liberal Arts, Dept. of Physics, *4841 Cass Ave., Detroit, Michigan* 48202 (PHY77-18760 A01)

A low-energy and highly monochromatic positron beam has been developed and used to initiate a complementary program of research involving the collisions of positrons with atoms and molecules.

The present measurements will be continued with increasing emphasis being placed on investigations of possible structural features in total scattering cross sections, such as Ramsauer-Townsend effects, resonances, and behavior near inelastic thresholds. The program will also be expanded into new areas of positron research, including positron collisions with atomic hydrogen and alkali atoms, and differential scattering of positrons. Comparison measurements between positrons and electrons in the same apparatus are an important part of this research program.

This work is a continuation of that currently supported under NSF grant number PHY75-07165 A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0027, THEORY OF QUANTUM FLUIDS

C.E. Campbell, University of Minnesota, Minneapolis Campus, Inst. of Technology, Dept. of Physics & Astronomy, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (DMR78-09226)

Research previously supported by DMR7614777.

Theoretical research in condensed matter physics will be carried out. The emphasis will be on the study of quantum fluids, with the aim of understanding their properties from a fundamental point of view.

The research will include: the structure and dynamics of liquid helium-four; the normal and pair-condensed phases of liquid helium-three; the liquid phase and lattice gas phases of adsorbed quantum fluids; the energy and structure of neutron and nuclear matter; the phase separation and spinodal decomposition of helium-three/helium-four mixtures; and the frequency dependence of the Raman scattering and fourth order dynamic structure function of room temperature argon gas.

The predominant theoretical approach will be the method of correlated basis functions and generalizations of Jastrow theory. In the systems to be studied, the most reliable interparticle potentials will be used, with a heavy emphasis on short-range correlations.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0028, SPECTROSCOPY OF ALKALI ATOMS TRAPPED IN RARE-GAS MATRICES

L.C. Balling, University System of New Hampshire, University of New Hampshire, School of Liberal Arts, Dept. of Physics, *Durham, New Hampshire* 03824 (PHY78-05369)

This investigation in atomic physics will study the interaction between specific types of atoms as the distance between them (which can be controlled) is held constant. The energy-level structure of alkali atoms trapped in various sites in rare-gas matrices at liquid-helium temperatures will be determined. Pulsed one- and two-step dye laser excitation will be used to locate the excited states; the lifetimes of these states and the wavelength distribution of the luminescence will be observed. Comparisons of the experimental results with theoretical calculations, carried on concurrently, will be made to determine the nature of the trapping sites. The effect of the rare-gas matrix on the energy-level structure of the alkali atoms will be calculated, using the same techniques employed to compute alkali-rare-gas diatomic potentials.

This is a continuation of work supported by NSF Grant PHY74-05548 A02.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0029, THEORY OF PHASE TRANSITIONS IN RANDOM SYSTEMS
M.J. Stephen, Rutgers the State University of New Jersey, New Brunswick Campus, School of Arts & Sciences, Dept. of Physics, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (DMR78-10276)

Research previously supported by DMR75-13350.

Theoretical research in condensed matter physics will be carried out. The main emphasis will be on the application of renormalization group methods to phase transitions in random systems. Of particular interest are those systems exhibiting strong randomness near the percolation threshold. Among the topics to be considered will be (a) pure percolation problems, (b) phase transitions in random magnets near the percolation threshold, and (c) the conductivity of random resistor networks and its relation to phonons in a random lattice and spin waves in random ferromagnets.

This research will enhance the understanding of the behavior of an important class of materials, i.e., disordered solids, under conditions near a phase transition.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0030, PIEZO-OPTICAL DETERMINATION OF DEFORMATION POTENTIALS IN MULTI-VALLEYED SEMICONDUCTORS
F. Pollak, City University of New York, Brooklyn College, New School of Liberal Arts, Dept. of Physics, *Bedford Ave. & Ave. H, Brooklyn, New York* 11210 (DN875773; N00014-78-C-0890)

Calculations of the properties of new semiconductor materials for use in electronic devices that find application in naval systems rely upon a number of material constants, many of which are unknown and difficult to determine. This program will seed to ascertain various parameters that affect transport in semiconductors.

An investigation of the stress-dependence of the optical absorption will be carried out in several III-V semiconductors. Wavelength modulated transmission from valence to conduction band. From the transition rates and the scattering processes, the absolute values for the electron-phonon and hole-phonon deformation potentials for intervalley processes can be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0031, THEORETICAL NUCLEAR PHYSICS
C.M. Shakin, City University of New York, Brooklyn College School of Science, Dept. of Physics, *Bedford Ave. & Ave. H, Brooklyn, New York* 11210 (PHY77-05016 A01)

Research in theoretical nuclear physics initiated under NSF grant PHY75-06932 A01 will be continued. Topics to be investigated include: 1. pion physics; a. pion-nucleus scattering; b. pion creation and absorption; 2. deuteron-nucleus collisions; 3. many-body theory; 4. heavy-ion physics; a. foundations of TDHF theory for heavy-ion collisions; b. heavy-ion collisions at medium and high energies; 5. three-body problem at medium and high energies; 6. general scattering theory; 7. scattering of electrons by nuclei.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0032, SUPERCONDUCTIVITY IN TRANSITION METAL SUBSTITUTED A-15 SYSTEMS
F.J. Cadieu, City University of New York, Queens College, School of Liberal Arts & Science, Dept. of Physics, *65-30 Kissena Blvd., Flushing, New York* 11367 (DMR78-03217)

This is a continuation of work sponsored under DMR74-18138.

The A-15 phase of compound systems of the form (Nb1-yTy)1-xGex), where T is the transition metal atom Mo, Ti or Zr, will be synthesized via RF sputtering techniques. Metallurgical characterization will be accomplished by the use of X-rays and X-ray fluorescence techniques. Superconducting state parameters such as Tc and dHc2/dT will be determined from AC inductance data. Such data will be correlated with composition and microstructure to delineate those physical parameters which maximize Tc. Auger and electron loss spectroscopy will be used to obtain information about the effect of T-atom substitution upon N(O), the electronic density of states evaluated at the Fermi level. This work is important to our basic understanding of high (greater than 18K) Tc superconductors and will impact on energy related problems via large scale applications of high Tc superconductors.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0033, EXPERIMENTAL INVESTIGATION OF ELECTRON LOCALIZATION PHENOMENA IN DISORDERED SYSTEMS
D.F. Holcomb, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Physics, *Ithaca, New York* 14850 (DMR78-10728)

Materials of interest in this investigation are disordered substitutional impurity systems which undergo an insulator-to-metal transition as a function of composition. The ability to reliably predict properties of a given material depends, among other things, upon firmly known answers to two questions: (1) What is the mechanism for electron localization in these materials? and (2) What is the correct model to use to describe electron transport in the regime of strong scattering of electrons, just at the transition concentration? Concerning the first question, experiments will be carried out to test the relevance of the Anderson localization model to the metal-insulator transition in semiconductor impurity systems, in sodium tungstate crystals, and a new class of untested materials. Initial experiments will use multiple doped crystals, Si:B, Al, Ga and Si:Li, P, as, to study the effect which a spread in the value of impurity binding potentials has upon the value total impurity concentration at which electron delocalization occurs. This value will be monitored by measurements of electrical conductivity and Hall constant at low temperature. Concerning question (2), studies of NMR relaxation times will be used to measure electron jump times as a function of composition and temperature, in order to study the evolution of the strong-scattering regime as one moves from delocalized to localized electron states.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0034, ELECTRONIC STRUCTURE OF HIGH-TEMPERATURE SUPERCONDUCTORS
S.J. Williamson, New York University, Washington Square & University College of Arts & Sciences, Dept. of Physics, *421 1st Ave., New York, New York* 10012 (DMR76-02043 A02)

This is a continuation of work performed under DMR76-02043. Studies will be made of thermal expansion and the response to applied uniaxial stress of various A-15 crystals. Band model calculations for the A-15 crystals, based on a k.p approximation for bands near the corner of the Brillouin zone, will be made to attempt to account for the anomalous temperature dependence of the electrical resistivity of some A-15 crystals. These calculations will be extended to specific heat and certain elastic constants. The thermal expansion of single crystals of V3Si will be studied above and below Tc to test the predictions of the above model.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0035, MATERIALS SUPPORT TECHNOLOGY - STATISTICAL MECHANICS OF TWO-DIMENSIONAL ELECTRON FLUIDS
A. Isihara, State University of New York, Buffalo Campus, School of Natural Sciences & Mathematics, Dept. of Physics,

3435 Main St., Buffalo, New York 14214 (DN975472; N00014-79-C-0451)

Inversion layers at semiconductors surfaces are important in many electronic devices used in naval systems for communication, surveillance, command and control. This research will contribute to understanding of the fundamental properties of electrons confined in two-dimensional layers.

The investigator will study the properties of the two-dimensional electron fluid, with particular attention to the formation of the Wigner lattice, using a simplifying transformation deduced from an electrostatic analog to the dielectric function. Treatment of the zero temperature 2-D dielectric function will be followed by extension to finite temperatures, the correlation function, and the 3-D system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0036, MAGNETIC AND ELECTRICAL STUDIES IN N-TYPE SEMICONDUCTORS

T.G. Castner, University of Rochester, School of Arts & Sciences, Dept. of Physics & Astronomy, *260 Crittenden Blvd., Rochester, New York* 14627 (DMR77-20450)

Experimental studies of the dielectric behavior, frequency-dependent conductivity, and magnetic behavior of heavily doped N-type semiconductors doped near the critical concentration for the onset of metallic behavior, which were previously supported by NSF grant DMR-7612586 will be continued. These studies should give new information concentration for the onset of metallic behavior, which were previously supported by NSF grant DMR-7612586 will be continued. These studies should give new information concerning (1) the origin of the unsatisfactorily explained negative magnetoresistance of heavily doped semiconductors, (2) the components of the single valley donor polarizability tensor, (3) the frequency dependence of the conductivity into the microwave region in the liquid-helium temperature range, and (4) the very low-temperature spin ordering and exchange interactions as a function of donor concentration. Capacitance measurements, magnetocapacitance measurements, piezocapacitance measurements using uniaxial stress, low frequency and microwave conductivity measurements, and magnetization studies yielding information on magnetic susceptibilities will be made. In addition to measurements in the 4 K to 1.1 K range, certain measurements will be made to 0.01 K in a dilution refrigerator. Magnetic fields up to 115 kilogauss will be employed. These studies will aid in understanding how donor wave functions behave in zero and large magnetic fields at concentrations close to the metallic transition and the nature of the conductivity processes involving these donor electrons.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0037, OPTICAL STUDIES OF SUPERCONDUCTING TUNGSTEN BRONZES

E.M. Brody, University of Rochester, School of Engineering & Applied Science, Dept. of Aerospace & Mechanical Science, *260 Crittenden Blvd., Rochester, New York* 14627 (DMR78-12993)

Raman and Brillouin inelastic light scattering and photoelastic modulation ellipsometry will be used to study the electron and phonon properties affecting superconductivity in the hexagonal tungsten bronze system AxWO3 (A equals K, Rb, Cs, Tl) as a function of composition and temperature. The Brillouin studies will probe for acoustic phonon softening and permit the determination of the single crystal elastic moduli. Ellipsometry will be used to determine the optical constants necessary to interpret the Brillouin spectra. This work is important for determining the properties of materials which govern their macroscopic superconducting behavior.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0038, POINT DEFECTS IN IONIC CRYSTALS - ROLE OF THE SURFACE CHARGE

L.M. Slifkin, University of North Carolina, Chapel Hill Campus, Graduate School, Dept. of Physics, *Chapel Hill, North Carolina* 27514 (DMR78-09198)

Surfaces of ionic crystals generally are electrically charged because of an excess of surface kinks of one sign. The compensating ionic space charge has a depth of about 0.1 micron, across which there is a potential difference often of about 0.2 volt. Very large perturbations of concentrations of point defects in this region give rise to a number of interesting and important effects. This phenomenon is being studied in the silver halides, which are attractive media because of the firm groundwork already established (a result of the importance of these effects to the photographic process) and also because the very high ionic conductivity of the space charge layer makes possible experiments not feasible with other materials. The following experiments are performed: (1) Space charge is studied by measuring the conductivity as a function of thickness of evaporated films, and of various adsorbed species. (2) Equilibrium concentrations, at various temperatures, of divalent dopants, are determined as a function of depth below the surfaces of single crystals. (3) An experiment not involving surface charge phenomena is suggested by the diverse ways in which iodide addition affects the properties of AgCl and AgBr photographic emulsions: elastically bound complexes between I and point defects are to be sought.

This is the first year of a three-year continuing grant.

It is a continuation of work supported by DMR 76-18862.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0039, HIGH RESOLUTION STUDY OF TWO-ELECTRON ONE-PHOTON INNER-SHELL TRANSITIONS

J.R. Mowat, University of North Carolina, North Carolina State University, School of Physical & Mathematical Sciences, Dept. of Physics, *Raleigh, North Carolina* 27607 (PHY77-27526)

This project in atomic physics will study further the recent discovery of two-electron transitions within atomic inner shells. The principal observation is the detection of a high energy x-ray emitted when two electron simultaneously jump into pre-existing vacancies in the innermost electronic shell. The double vacancy can be produced by any one of several processes, the most efficient being a high speed ion-atom collision.

The initial objective of this research is to make-high-resolution spectral measurements of the x-ray accompanying two-electron transitions between atomic inner shells. A newly developed technique (Doppler-tuned spectroscopy), that is 100 times more precise than (but just as sensitive as) previous methods, will accurately test transition-energy calculations, and will, for the first time, clearly determine the electronic configurations from which these transitions originate. A second objective is to measure the intensities of the resolved features as a probe of the importance of the electron-electron repulsive force for inner-shell atomic structure.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0040, ELECTRONIC STRUCTURE OF CRYSTALS AND ALLOYS

B.S. Segall, Case Western Reserve University, Graduate School, Dept. of Physics, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (DMR76-21550 A01)

Research previously supported by DMR76-21550.

Theoretical condensed matter research will be carried out. The main areas of research will be the calculation of the electronic structure and some associated (e.g., optical and x-ray) properties of pure metals crystals and random alloys. Accurate electronic structure and useful wave functions will be obtained by the Chen-Segall parameterization scheme which utilizes a few pieces of empirical data. The coherent potential approximation approach will be implemented for the study of random alloys. The first alloys to be studied will be those of the CuAu and CuZn systems. It is also planned to study the ordered

Cu3Au and Beta prime CuZn phases of these systems. X-ray spectra of the alloys will be obtained. A study of the dependence of the surface electronic structure of one-dimensional semi-infinite crystals and films on the parameters of the problem (e.g., strengths and shapes of the 'atomic' and barrier potentials, film thickness) will be completed.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0041, MINORITY CARRIER INJECTION INTO MATERIALS CONTAINING TRAPS

H.K. Henisch, Pennsylvania State University, University Park Campus, School of Science, Dept. of Physics, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (DMR76-80619)

Experiments will be conducted on the voltage-current characteristics of metal-semiconductor and semiconductor-semiconductor contacts in two distinct operational regimes as regards trapping of injected minority carriers. The two regimes will be established by varying (a) the ambient temperature, and (b) the trap concentration, the latter through neutron bombardment and/or heat shock. Recently published theoretical treatments lead to the conclusion that trapping should play a major role in determining the voltage-current relationship in the forward direction, so much so that resistance increases have been predicted as a result of injection when the trap density is high enough. There are indications (from the published and unpublished results of other workers) that this is indeed the case, and the present project is intended as a designed experimental test under ideal conditions. Though effects related to surface states and effects related to bulk trapping cannot be unambiguously resolved by the measurement of a single voltage-current relationship, there should be no difficulty in resolving them by comparative experiments under distinctly different trapping probabilities, and by the in situ introduction of traps into a completed system. Germanium will receive principal attention, though it is also planned to perform comparative measurements on other single-crystal semiconductors.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0042, STATISTICAL MECHANICAL STUDIES OF PHASE TRANSITIONS

M.S. Green, Temple University, Graduate School, Dept. of Physics, *1821 N. Broad St., Philadelphia, Pennsylvania* 19122 (DMR78-07201)

Research previously supported under DMR74-01951. Theoretical research in condensed matter physics will be carried out. Statistical mechanics will be used to investigate the dynamics of first and second order phase transitions, the foundations of the equations of hydrodynamics, the nature of the critical point in a Van der Waals fluid and the mathematical properties of the renormalization group.

This research is focused on understanding the fundamental behavior of condensed matter near a critical point or phase transition.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0043, GENERAL RELATIVITY AND ASTROPHYSICS

P. Havas, Temple University, School of Liberal Arts, Dept. of Physics, *Broad St. & Montgomery Ave., Philadelphia, Pennsylvania* 19122 (PHY77-28356)

A research program in theoretical gravitation will be initiated. Among the topics to be investigated are: A. General Relativistic Dynamics; 1. Test particles; 2. Approximate equations of motion. B. Relativistic Thermodynamics; C. Electromagnetic and Gravitational Waves in Curved Space; 1. Radiation from pulsating neutron stars; 2. Radiation from rotating neutron stars; 3. Gravitational and neutrino waves.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0044, NUCLEAR RESEARCH WITH TANDEM ACCELERATOR

R. Middleton, University of Pennsylvania, School of Arts & Sciences, Dept. of Physics, *34th & Spruce Sts., Philadelphia, Pennsylvania* 19104 (PHY78-01396)

This is a continuation of research presently supported under PHY77-03852 AO1. A program of Nuclear Science studies will be carried out using an upgraded FN Tandem Van de Graaff accelerator. Work will continue using a tritium source developed at the University of Pennsylvania to study a variety of (t, beta) and (t, alpha) reactions on nuclei ranging from 9Be to 209Bi. However emphasis will be on light nuclei. Also (t, p gamma) studies using coincidence methods will be carried out. Lifetimes for beta-decay of nuclei produced by the (t,p) reaction will be studied using a beam chopper. Spin assignments of levels in 20 He and 24 Mg will be carried out using 12C(12C, alpha) and 17C(16O alpha) reactions. Work in heavy ion reactions using silicon and calcium targets and beams will study high spin states. Angular correlations using (d, p gamma) reactions will give information on the details of nuclear reaction mechanisms. Some applications of nuclear techniques to astrophysics and archeology will be pursued.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0045, QUASI-ONE-DIMENSIONAL STUDIES - SPIN-PEIERLS TRANSITIONS AND NEW MAGNETIC COOLING SYSTEMS

J.C. Bonner, University of Rhode Island, School of Arts & Sciences, Dept. of Physics, *Kingston, Rhode Island* 02881 (DMR77-24136)

Theoretical research will be carried out on quasi-one-dimensional systems. These investigations will be directed towards the spin-Peierls transition, which has been observed experimentally in a new class of metallo-organic complexes with TTF (tetrathiafulvalene). A second focus of this research will be magnetic cooling studies on quasi-one-dimensional insulators. Previous theoretical studies have treated the magnetic inter-ionic interactions rather crudely, using approximate theories which frequently violate the third law. The models to be studied here do not have this undesirable feature, and will make feasible quantitative comparisons of theory and experiment.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0046, SOFT X-RAY APPEARANCE POTENTIAL STUDY OF ERBIUM

D.R. Chopra, East Texas State University, School of Science & Technology, Dept. of Physics, *E. Texas Station, Commerce, Texas* 75428 (T-643)

The soft X-ray appearance potential spectrum (SXAPS) of the M levels of erbium (Er) has been obtained in the 1400-1500 eV energy range with a nondispersive spectrometer which measures the derivative of the total x-ray fluorescence of an electron-bombarded sample as a function of bombarding electron energy. The spectrum represents the self-convolution of the density of unoccupied 4f orbitals in Er. The data supplement the information derived from photoabsorption spectroscopy but is applicable to the surface region. The M5 spectrum selectively arising from the M5 yields N7 transition has the appearance of a line absorption preceded by two shoulder-like peaks at about 2.3 and 1.3 eV lower energies and a step-like onset. The M4 peak lacks prominent structure and is rather weak, in agreement with the forbidden M4 yields N7 transition. The spectral features correlate well with photoabsorption spectrum and the density of states calculations. The results are interpreted in terms of the

relatively weak exchange interaction between the 4f electrons and 3d vacancies where the spin-orbit interval is prominent.

SUPPORTED BY Robert A. Welch Foundation

8.0047, ANISOTROPY IN ION COLLISION EXCITATION

D.A. Church, Texas A & M University, College Station Campus, School of Science, Dept. of Physics, *College Station, Texas* 77843 (PHY78-26616)

An investigation of the production of anisotropically excited states in fast ions and atoms by collisions with gas molecules, and with solid and liquid surfaces, will be initiated. Controlled and analyzed surfaces and ion beams will be used to ascertain the effects of adsorbed gases, surface fields, scattering, and charge exchange on the excitation process. Coherence and coincidence measurements will be used.

This is the first year of a 3-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0048, ELECTRON SCATTERING FROM ALKALI VAPORS

M. Fink, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Physics, *200 W. 21st St., Austin, Texas* 78712 (F-534)

Electron diffraction is a well established method to study molecular structures. Today with the development of more advanced techniques more accurate data are collected, and more precise structure parameters derived. Before one can take advantage of these new results, several peripheral questions have to be studied. Our attention was focused lately to the problem of intramolecular multiple scattering and its influence on the structure parameters.

This spring the multiple scattering theory, based on the Glauber approximation, was extended with the cooperation of Drs. Bartell and Kohl and applied to SF6 New diffraction cross sections with 30, 40, and 50 KeV electrons were recorded and analyzed. All internuclear distances were found to be energy independent and to be in very good agreement with properly corrected spectroscopic values. However, the mean amplitudes of vibrations varied with the electron energy. After the data were corrected for multiple scattering, the amplitudes agreed for all energies with one of the spectroscopic value. A second value based on optical results could be eliminated. New work is underway to study the temperature dependence of the mean amplitudes of vibrations and to compare our results with the calculations of Cyvin which are based on harmonic force fields.

SUPPORTED BY Robert A. Welch Foundation

8.0049, LOW ENERGY ELECTRON SCATTERING AND NUCLEAR CHEMICAL STUDIES

C.F. Moore, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Physics, *200 W. 21st St., Austin, Texas* 78712 (F-261)

Pion-induced single-nucleon removal to discrete final states has been measured. Gamma radiation from targets of 7Li, 9Be, 12C, and 16O bombarded by positive pion and negative pion at energies between 60 and 300 MeV was uniquely associated with states formed by removing a single nucleon by the (pi,piN) reaction. All yields were found to reflect the 3-3 resonance in the proton-nucleon system. Ratios of yields for negative pion and positive pion beams were measured for 7Li, 9Be, and 13C. These ratios were very similar to one another and to previous results on 12C, 14N, and 16O for neutron removal. The ratios of negative pion to positive pion induced neutron removal (or of positive pion to negative pion induced proton removal) is about half that predicted by a quasi-free scattering mechanism, and displays an energy dependence unlike these predictions. High resolution Ar-LMM and Kr-MNN Auger spectra produced by oxygen and chlorine ions incident on argon and krypton at several MeV have been measured and comparisons are made with spectra from lighter ion impact. The increase of the probability from light to heavy ion impact for MNn multiple ionization in Kr is found to be comparably lower than for the MNn multiple ionization in Ar. The heavy ion induced spectra show in both cases a satellite line structure which is assumed to result from initial states consisting of highly ionized outer shells and additional electrons being excited into high bound levels.

SUPPORTED BY Robert A. Welch Foundation

8.0050, FUNDAMENTAL PROPERTIES OF NONTHERMAL EMISSION MECHANISMS IN RADIO SOURCES

J.J. Broderick, Virginia Polytechnic Inst. & State University, School of Arts & Sciences, Dept. of Physics, *Blacksburg, Virginia* 24061 (AST77-08013 A01)

The fundamental properties of nonthermal emission will be studied by radio astronomical techniques. The conditions required for the production of detectable nonthermal radio emission by stars, and the mechanisms by which it is produced, will be investigated by a series of complete radio surveys of 400 stars within 20 pc of the Sun. Sensitive surveys at 13 and 6 cm of several thousand galaxies brighter than mp equals 14.5 have been made and will be used to test current hypotheses relating radio structures and intensities to optical morphology, luminosities, and line spectra. Confusion-limited scans at 21 and 13 cm made in association with these surveys will be used to obtain statistical (P(D)) extragalactic source number counts and to detect possible anisotropy at the 1 mJy level. Very long baseline (VLB) interferometric observations of complete samples of extragalactic sources will be continued to isolate the effects of self-absorption and electron energy distributions on compact source spectra, and to relate source optical luminosity and morphology to radio core flux. Very long baseline pulsar data will be analyzed to yield unresolved calibration sources and information about the interstellar medium through a comparison of scattering sizes with dispersion measures. Interstellar scintillation observations will be made at low frequencies to find, or at least set strict limits on, possible high-brightness coherent emission mechanisms in extragalactic sources. The current research on optical identifications and spectroscopy of compact extragalactic sources will be continued. The nature of the hydrogen absorbing clouds in front of the quasi-stellar object 3C 286 and the BLLac object AO 0235 equals 164 will be investigated using spectral-line VLB techniques.

This is a continuation of work previously supported by NSF grant AST 77-08013.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

8.0051, PARITY TESTS IN ATOMS

E.N. Fortson, University of Washington, School of Arts & Sciences, Dept. of Physics, *Seattle, Washington* 98105 (PHY78-05897)

This is an experimental program in atomic physics. Experiments designed to look for a breakdown of parity conservation in free atoms can provide information about the neutral weak current interaction between electrons and nucleons. The present research is searching for optical rotation in atomic bismuth. Failure thus far to observe any such parity non-conservation in bismuth at the level predicted on the basis of Weinberg-Salem Theory of Neutral Currents indicates that the theory likely needs to be modified. To establish this important result more firmly and to test predictions of other weak interaction models, further optical rotation experiments with bismuth and with other elements will be carried out. These experiments should provide information that will complement neutrino studies of neutral current interactions at high energy.

This is a continuation of work currently supported under NSF Grant PHY74-17319 A05.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0052, SPATIAL ORDERING TRANSITIONS IN TWO-DIMENSIONS WITH APPLICATIONS TO ADSORBED SYSTEMS
M. Schick, University of Washington, School of Arts & Sciences, Dept. of Physics, *Seattle, Washington* 98105 (DMR77-21842)

The research program supported by NSF grant DMR 73-02582 will be continued and extended. Transitions in adsorbed systems to states in which the adsorbate is found in a spatially ordered array will be studied theoretically. Many of these transitions are in universality classes of current interests in the theory of phase transitions and critical phenomena. Theoretical methods previously developed will be applied to other classes of transitions. Investigation of systems with greater internal symmetries than those of adsorbed atoms will be conducted.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0053, ELECTRICAL CHARACTERIZATION OF GERMANIUM AND MAGNESIUM IMPLANTED GALLIUM ARSENIDE
F.L. Pedrotti, Marquette University, School of Liberal Arts, Dept. of Physics, *604 N. 16th St., Milwaukee, Wisconsin* 53233 (DF05130; AFOSR-79-0113)

AF function - microwave solid state devices are essential components of Air Force surveillance, electronic countermeasures and communication systems. The ability to tailor GaAs to device applications is greatly improved when we know the properties which result from the use of various ion species in the ion implantation process. Opportunity - increase the possibility of consistently producing N-type layers in GaAs with high free electron concentrations. Objective - the objective of this research is to perform characterization measurements on ion implanted specimens now being produced at AFDL/DHR. How work contributes - this work will provide feedback to establish ion implantation conditions to improve semiconductor materials for devices.

Hall/resistivity measurements and chemical etching will be used to determine electrical activation and mobility as a function implantation depth. Low temperature anneals will be used in the effort to determine the diffusion coefficients of the implanted ions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, THEORETICAL ASTROPHYSICS
R.D. Blandford, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (AST78-05484)

Theoretical and interpretative studies in topics of current astronomical interest will be carried out. Research that relates to radio astronomical observations will be emphasized. Specific areas that will be investigated include: (1) Models of superluminally expanding compact radio sources involving the propagation of shock waves; (2) Black-hole models of quasars; (3) Radio emission from Jupiter's magnetosphere; (4) Statistics of pulsars.

This is a continuation of research previously supported by grant AST 76-20375.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0002, A STUDY OF PRE-FLARE POLARIZATION CHANGES IN SOLAR ACTIVE REGIONS AT 2.8 CM
R.N. Bracewell, Stanford University, Stanford Electronics Lab., *Stanford, California* 94305 (ATM77-09072 A01)

The Stanford radio interferometer has been used to map solar active regions at 2.8 cm wavelength. On one series of maps of an active region, the peak of the circularly polarized emission appears to be shifted towards the central meridian relative to the peak of the total intensity.

This study is to test the existence of this effect using the Stanford interferometer to map several active regions as they travel from limb to limb. The maps will show both the total intensity and the polarized emission. A comparison with photospheric magnetograms will contribute to elucidation of the structure of magnetic fields in the chromosphere and corona. Should a region flare during a mapping observation, which is likely, the flare pre-history will have been automatically recorded and changes in the polarization before, during and after the flare will be documented. If systematic pre-flare changes are observed a valuable clue to flare prediction may have been found.

The overall objective is to use radio observations to improve our understanding of solar flares.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

10.0003, OPTICAL OBSERVATIONS OF CELESTIAL X-RAY SOURCES
C.S. Bowyer, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (AST78-06873)

The research to be carried out on this grant will be concerned with ground-based optical observations of celestial X-ray sources. Observations will be made of the source Aquila X-1 in order to obtain information on the long-term optical and X-ray behavior of this source. There will be observations of the X-ray pulsar AO535 plus 26 in order to determine if it and other transient X-ray stars are binary systems. The X-ray source Sco X-1, which is the brightest X-ray source in the sky, will be studied. Observations at optical wavelengths will be obtained at the same time as observations are made at other wavelengths. High galactic latitude X-ray sources will also be examined. There will be simultaneous optical observations on X-ray sources as they are being scanned by the HEAO-1 X-ray satellite. A search will be made for the optical counterparts of Southern Hemisphere galactic X-ray sources. Finally, there will be optical studies of low-luminosity stars associated with Southern Hemisphere galactic X-ray sources.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0004, INVESTIGATION OF THE 1-0 QUADRUPOLE SPECTRUM OF HYDROGEN IN ASTRONOMICAL OBJECTS
J.E. Gaustad, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (AST78-06715)

A study of the 1-0 rotation-vibration band of molecular hydrogen (H2) in astronomical objects will be continued. The goals of this study are: 1. to study the radial velocity and profile of the S(1) line in known H2 sources in order to understand the dynamics of the emitting regions; 2. to search for H2 in other astronomical objects and to map its distribution in them; in particular to study the relation of H2O maser sources and H2 emission; 3. to measure the intensity of different quadrupole lines in order to study their excitation.

A Fabry-Perot spectrometer will be used for the observations.

This is a continuation of grant AST76-80198.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0005, STUDIES OF THE INTERSTELLAR GAS AND MAGNETIC FIELD

C. Heiles, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (AST78-06713)

Studies of the angular structure and kinematics of the interstellar gas, and of the interstellar magnetic field as revealed by Zeeman splitting of spectral lines will be continued. The combination of the Northern hemisphere Hat Creek Radio Observatory survey and Southern hemisphere surveys of the 21-cm wavelength line of interstellar atomic hydrogen will be continued and completed. The numerous shells of interstellar gas recently discovered by the University of California, Berkeley, radio astronomers will be observed in atomic emission lines in the optical, molecular emission lines in the radio, and the 21-cm wavelength line in both absorption and emission. The studies of the interstellar magnetic field will be continued and intensified by performing Zeeman splitting observations of the 21-cm line and the 18-cm hydroxyl (OH) molecular lines in both emission and absorption, and of ionized hydrogen recombination lines in emission. The Hat Creek 85-foot telescope will be used to start an intensive effort to detect the 3.5-cm wavelength line of the cosmologically significant helium isotope 3He ion by using high-quality electronics and long integration times. The Hat Creek telescope will also be used to begin in what is envisioned as a long-term program to locate dense regions within nearby dark clouds and with carbon monoxide (CO) concentrations in the glactic plane and the glactic interior, using the 3.3-cm J equals 1 yields 0 transition of cyanoacetylene (HC3N).

This is a continuation of grant AST74-17362 AO3.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0006, CHEMICAL FRACTIONATION IN THE SOLAR NEBULA AND THE FORMATION LOCATIONS OF CHONDRITIC METEORITES

J.T. Wasson, University of California, Los Angeles Campus, School of Letters & Sciente, Dept. of Planetary & Space Science, *405 Hilgard Ave., Los Angeles, California* 90024 (EAR78-03336)

This project concerns a chemical investigation of chondritic meteorites which will define better what have been interpreted as chemical fractionation in the solar nebula and as fractionation that took place during the formation of planetesimals. The 'volatile' elements Au, Mn, Na, Ga, Ge, Zn, Cd, and In will be determined in CI, CM, CO and CV chondrites to establish apparent temperature-dependent fractionation trends in this group of meteorites. In addition, preliminary data indicate that systematic variations occur in the abundance of certain siderophile elements in ordinary chondrites. About 20 ordinary chondrites will be analyzed by INAA techniques for Ir, Ni, Au, and Ge, in order to test these trends.

The analytical results of this study will lend themselves to a more precise definition of the condensation history of the solar nebula and to the processes involved in the formation of planetesimals.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Earth Sciences

10.0007, STUDY OF SOLAR AND ATMOSPHERIC NEUTRONS OF 2 TO 100 MEV AND GAMMA RAYS OF 0.5 TO 30 MEV

R.S. White, University of California, Riverside Campus, Inst. of Geophysics & Planetary Physics, *Riverside, California* 92502 (ATM77-08483 A01)

This grant will provide partial support for a search for solar neutrons of 2-100 MeV and gamma rays of 0.5 to 30 MeV and gamma rays of 0.5 to 30 MeV during solar flares and quiet times. It will extend the measurements of the earth's albedo neutron and gamma ray fluxes in latitude, angle and energy. These observations will be carried out on a four-day flight. The instrument to be used has high efficiency, excellent directionality, wide aperture, good energy resolution, and excellent background rejection. Additional calibrations will be carried out with gamma rays produced by protons bombarding targets at the Van de Graaff accelerator at California State University, Los Angeles. Data analysis on a previous flight from Palestine, Texas will be carried out. The data from two previous flights are being searched for gamma rays and solar neutrons.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0008, INVESTIGATIONS OF THE COSMOLOGICAL CONSEQUENCES OF ANTIMATTER

H. Alfven, University of California, San Diego Campus, Graduate School, Dept. of Applied Physics & Information Science, *P.O. Box 109, La Jolla, California* 92037 (AST76-15521)

The theoretical investigation of the consequences of Klein's hypothesis that the universe contains large amounts of antimatter will be carried out. The role of antimatter in cosmogony, including methods whereby it can be separated, and the scale of that separation will be explored. The observable consequences having matter and antimatter interacting and the relation of the cosmic X-ray background and recently observed sporadic cosmic X-rays will be considered. The cosmic X-ray background may arise from interpenetrating gas, and the sporadic X-rays may be caused by the collision between condensed normal and antimatter.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0009, STUDIES OF SOLAR AND MAGNETOSPHERIC PARTICLES

S.M. Krimigis, Johns Hopkins University, Applied Physics Lab., *Johns Hopkins Rd., Laurel, Maryland* 20810 (ATM76-81099)

This grant is for scientific studies of data on charged particle intensities, angular distributions, energy spectra, and compositions obtained with the Charged Particle Measurement Experiment built by The Johns Hopkins University Applied Physics Laboratory and carried aboard the NASA satellites IMP-7 and 8. Similar data from JHU/APL experiment on IMP-6 will be examined in conjunction with that from IMP-7 and 8. Data from other experiments on the same spacecraft will also be used on a cooperative basis with other investigators.

In general terms, the objectives of this study are to obtain new information and understanding of the electrodynamics and plasma physics of the terrestrial magnetosphere, interplanetary medium and the Sun. The specific studies will concern themselves with two areas: (a) The study of particle acceleration phenomena in the earth's magnetotail, with emphasis on plasma sheet and neutral sheet measurements of particle pitch angle distribution, charge, and energy spectra. Particular emphasis will be devoted to analysis of events from two or more closely spaced spacecraft. (b) A statistical and case-by-case study of the charge composition of solar particle emissions, particularly during active periods, and delineation of the dependence of composition on energy, flux level, location on the solar disk, spatial structure in the interplanetary medium, and interaction with the earth's magnetosphere.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0010, ASTRONOMICAL RESEARCH - TO COMPILE AND PUBLISH A CATALOGUE OF STELLAR MOTIONS LARGER THAN 0.2 ANNUALLY IN ARC SECONDS

W.J. Luyten, University of Minnesota, Minneapolis Campus, Inst. of Technology, Dept. of Physics & Astronomy, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (AST76-80612 A01)

Preparation of a catalog of stars with proper motions in the range 0.2 to 0.5 arc second per year will be continued. Under support of this award, the second and third part, covering the

sky between declination 30 degrees North and 30 degrees South, will be prepared and published. The survey for these stars of large motion has been carried out on pairs of plates taken with an interval of 10 to 15 years at Palomar Mountain Observatory using the 48-inch Schmidt telescope. Measurement was carried out with the automated measuring machine furnished by NASA.

Publication of the catalog will make available to the astronomical community material useful for kinematic studies of the sun's neighborhood, for selection of candidates for distance measurement, for studies of the luminosity function of the stars to faint limits, and for astrophysical studies of selected individual stars.

Prior support was by NSF grant AST 76-80612.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0011, THE STRUCTURE OF SYSTEMS OF GALAXIES
H.J. Rood, (No Performing Organization Reported), *New Jersey* (AST77-17958)

Research on the structure of systems of galaxies contributes to our knowledge of cosmology and the evolution of galaxies. This proposal is concerned primarily with investigations into problems related to groups of galaxies and groups of galaxy clusters.

Twenty-one centimeter hydrogen line profiles of galaxies in groups obtained at the National Radio Astronomy Observatory will be used in an extensive virial analysis of nearby groups of galaxies to establish their characteristic mass-to-light ratio, the origin of various correlations among virial parameters, and whether the groups are mostly bound or expanding in the Hubble flow.

As an extension of a previously published study on groups of clusters, large samples of Abell clusters will be used to determine if groups of clusters are randomly distributed in space, if properties of clusters depend significantly on whether they are group members, and if the dominant motion of clusters in groups is the Hubble flow.

This is a continuation of work done under grant AST 75-18667.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0012, FIELD-DEPENDENT COSMIC-RAY ANISOTROPIES IN INTERPLANETARY SPACE AT HIGH RIGIDITIES
V.H. Regener, University of New Mexico, School of Arts & Sciences, Dept. of Physics & Astronomy, *University Hill N.E., Albuquerque, New Mexico* 87106 (ATM76-11743 A01)

This grant will continue studies of cosmic-ray anisotropies in interplanetary space surrounding the Earth, and of their dependence on the characteristics of the interplanetary magnetic field, using an expanded network of large underground cosmic-ray telescopes. This work is expected to yield information on cosmic-ray modulation at high energies, which can only be reached with underground detectors, as a function of the parameters of the interplanetary magnetic field, and of the solar magnetic field. The field-dependent anisotropies being investigated are particularly amenable to study in the forthcoming period of solar maximum. Support is being requested for the continued data acquisition, reduction and interpretation, as well as for the continued operation, for two years, of two currently operating large multi-directional meson telescope recorders (4 square meters each) at Embudo Cave, and Socorro, New Mexico; also for the installation and operation of a giant telescope (18 square meters) at a greater depth underground in Arizona.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0013, OBSERVATION AND THEORY IN THE DEVELOPMENT OF ASTRONOMY
B.R. Goldstein, University of Pittsburgh, School of Arts & Sciences, Dept. of History & Philosophy of Science, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (SOC77-23594 A01)

Dr. Goldstein is collecting and analyzing reports of medieval observations of the planets, the moon, and eclipses that survive in Hebrew and Arabic manuscripts for the elucidation of medieval observational techniques and for their potential use by modern astronomers. A search of these manuscripts for additional data on total solar eclipses and other celestial phenomena is also being undertaken.

This research will help to clarify the relationship between theory and observation as well as the way in which instruments were modified on the basis of observational experience in the history of astronomy. Furthermore, the historical records, particularly of eclipses, will help contemporary astronomers in their study of the secular acceleration of the earth and the moon.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Biological Behavioral &
Social Sciences, Div. of Social &
Economic Science

10.0014, EMPIRICAL DETERMINATION OF THE CEPHEID AND RR-LYRAI DISTANCE SCALES (ABBREV)
T.G. Barnes, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST76-21316 A01)

A new method will be used to calibrate the classical Cepheid distance scale and the period-luminosity relation. Simultaneous photometric and spectroscopic observations will be made of these variable stars. The photometry will be used to determine the variation in angular diameter with phase. The spectroscopic and photometric measurements will be used to give the distance and the mean linear radius of each variable. A similar program will be crried out on the RR-Lyrae variable stars.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0015, A MAGNETIC-TAPE CATALOG OF SPECTROSCOPIC AND BIBLIOGRAPHIC STELLAR DATA
S.B. Parsons, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST76-20254)

The Bidelman file of spectroscopic information and references for about 50,000 stars will be put into machine-readable form at the University of Texas. The file covers much of the astronomical literature and contains much unpublished material not available in other major catalogs.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

GENERAL

11.0001, SCIENCE AND CIVILIZATION IN CHINA
J. Needham, East Asian History of Science Inc., *11 S. LaSalle St., Chicago, Illinois* 60603 (SOC79-06589)

This project will assist Professor Needham to complete, with the assistance of a number of collaborators, his monumental study of Science and Civilization in China. Four of the projected 7 volumes have already been completed. The first volume is essentially introductory. The next volume deals with Chinese philosophy and the development of scientific thought. The third volume begins the study of the scientific sciences, mathematics, astronomy, meteorology and the earth sciences. In the fourth volume physics and the engineering sciences are surveyed. The fifth is devoted to chemistry together with its many industrial and artistic applications. The biological sciences occupy the whole of the sixth volume. In volume 7 there follows a collective account of the special characteristics of sci-

ence in classical Chinese culture. Throughout the work the Chinese contributions are considered in relation to the achievements of other civilizations. Two questions are raised in this process: Why did modern science, the mathematization of hypotheses about Nature, with all its implications for contemporary technology, take its meteroric rise in the West only, at the time of Galileo? Why was it that between the first and the fifteenth century of our era East Asian culture was much more efficient than the European West in applying human knowledge of nature to useful purposes? Only an analysis of the social and economic structures of Eastern and Western cultures, not forgetting the great role of systems of ideas, will in the end suggest an explanation of both these things.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Biological Behavioral & Social Sciences, Div. of Social & Economic Science

American Institute of
Aeronautics and Astronautics

announces

Two New Films

America's Wings

The spirit and joy of creativity as exemplified in aircraft design is the story of this film. America's Wings looks at everything that has happened since Kitty Hawk and the "somebodies" who made it happen. (28.5 minutes, 16 mm color)

The Age of Space Transportation

Every breakthrough in transportation, from the wheel to the jet engine, has brought with it enormous social change. "The Age of Space Transportation" takes a particular look at mankind's next giant step in moving around -- the Space Shuttle, the vehicle itself and its implications. (20 minutes, 16 mm)

For information on obtaining these films, contact:
American Institute of Aeronautics and Astronautics
1290 Avenue of the Americas
New York, N.Y. 10019

VOLUME 18 NUMBER 16/AUGUST 23, 1980

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N80-25274* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 122
May 1980 96 p
(NASA-SP-7037(122)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 303 reports, articles, and other documents introduced into the NASA scientific and technical information system in April 1980. Author

N80-25275# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
AIRCRAFT INTEGRATED DATA SYSTEMS
Feb. 1979 363 p refs Partly in GERMAN and ENGLISH Presented at 9th Symp. on Aircraft Integrated Data Systems, Friedrichshafen, West Germany, 26-27 Sep. 1978
(DFVLR-Mitt-79-03) Avail: NTIS HC A16/MF A01

The following topics are covered: experiences with a flying data recording system, LEADS 200 engine parameter trend analysis, local fault detection on turbojet engines, localization of faults in jet engines through calculation of component characteristics, engine usage monitoring system, classification of operating conditions of turbomachines from solid-borne sound, reduction of measured data, the British civil aviation airworthiness data recording program, SYDAS flight data processing system, use of AIDS data at KLM, Navaid calibration evaluation, reconstruction of flight path, automatic fault identification system, processing of flight recorder data. For individual titles, see N80-25276 through N80-25290.

N80-25276# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
EXPERIENCES WITH A FLYING DATA RECORDING SYSTEM (FORS) IN A GERMAN AIRFORCE FIGHTER BOMBER WING AFTER A TROOP TAIL c06
H. Harsch *In its* Aircraft Integrated Data Systems Feb. 1979 p 11-26 In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

A one year test of the LEADS-200 digital flight data recording and processing system was carried out. A description of both hardware and software aspects of the system is given. The test data are described and discussed in some detail. Emphasis is placed on accident and maintenance aspects and on the influence of flight safety and operational management. Author (ESA)

N80-25277# Technische Hochschule, Aachen (West Germany). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.
ENGINE PARAMETER TREND ANALYSIS BY LEADS 200: POSSIBILITIES AND LIMITATIONS c07
W. Koschel *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 29-55 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

Causes of fighter aircraft engine damage were analyzed with a view toward identifying engine components that should be monitored over the long term in order to ensure aircraft safety. The possibility of recognizing deterioration of these components using data from the LEADS 200 flight recorder system is discussed and illustrated by examples. Author (ESA)

N80-25278# Technische Hochschule, Aachen (West Germany). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.
INVESTIGATIONS ON LOCAL FAULT DETECTION AT TURBOJET ENGINES c07
H. Toenskoetter *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 57-83 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

Some results of experiments that simulated faults in a single spool turbojet engine are presented. The effect of small disturbances such as low compressor air bleed, a single removed turbine guide vane, or one plugged fuel nozzle are described as a function of local and averaged aerothermodynamic parameters. Author (ESA)

N80-25279# Technische Universitaet, Brunswick (West Germany). Inst. fuer Maschinenelemente und Foerdertechnik.
LOCALIZATION OF FAULTS IN JET ENGINES BY CALCULATION OF COMPONENT CHARACTERISTICS c07
G. Dahl *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 85-112 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

A method to calculate the component characteristics of single spool jet engines was developed using measured engine data. The method was tested by simulating a large number of different faults on a J-85 engine, recording measured engine data, and performing a fault diagnosis on the basis of the measured data. The method is capable of localizing single and multiple faults of arbitrary nature and magnitude. Author (ESA)

N80-25280# Rolls-Royce Ltd., Bristol (England). Aero Div.
THE ENGINE USAGE MONITORING SYSTEM (EUMS): AN HEURISTIC APPROACH TO COST EFFECTIVE FLIGHT DATA MONITORING AND ANALYSIS c07
F. Robinson *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 113-138 refs (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

An engine monitoring system is described that is capable of accurately measuring low cycle fatigue usage during service operations. Up to 16 parameters relating to engine reliability can be recorded at intervals of one half second. Author (ESA)

N80-25281# Technische Universitaet, Munich (West Germany). Inst. fuer Flugmechanik und Flugregelun.
RELATIONS FOR A FLIGHT PERFORMANCE COMPUTER c06
M. Kloster *In* DFVLR Aircraft Integrated Data Systems Feb.

1979 p 139-150 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

Formulas are discussed to approximate drag, thrust and fuel consumption as functions of altitude and Mach number. The flight performance in the case of steepest climb and greatest acceleration is derived. It is shown that the resulting equations can be numerically solved by a small onboard computer. The formulas are simplified in order to obtain analytic relations.
Author (ESA)

N80-25282# Karlsruhe Univ. (West Germany). Inst. fuer Thermische Stroemungsmaschinen.
CLASSIFICATION OF OPERATING CONDITIONS OF TURBOMACHINES FROM SOLID BORNE SOUND c07
D. Barschdorf, B. Stuehlen, and W. Mach *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 151-168 refs (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

A method is presented for continuously monitoring turbine engine conditions using acoustic signature procedures. Rotor synchronous measurement of accelerometer values and formal pattern recognition methods are used. Correlation between measured data and certain working or fault machine conditions is accomplished by data collection during a learning phase. Only small computers are needed to implement the method.
Author (ESA)

N80-25283# Technische Universitaet, Brunswick (West Germany). Inst. fuer Maschinenelemente und Foerdertechnik.
REDUCTION OF MEASURED DATA AND A METHOD OF EARLY DETECTION OF SENSOR BREAKDOWN c06
G. Dahl *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 169-185 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

Procedures were developed to prepare and reduce automatically recorded data in order to assess the reliability of sensors. The data were divided into blocks of constant levels and statistical methods were used to determine their mean value, standard deviation, and regression line. A strong increase in the variation coefficient is found to indicate sensor faults. Author (ESA)

N80-25284# Civil Aviation Authority, Redhill (England).
DESCRIPTION OF THE BRITISH CIVIL AVIATION AIRWORTHINESS DATA RECORDING PROGRAM c06
H. D. Ruben *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 187-214 (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

The application of routine operational flight recorder data to airworthiness problems and the maintenance of safety standards is described. The various ways in which the data have been analyzed is illustrated with examples. A brief history of airworthiness data recording is presented as well. Author (ESA)

N80-25285# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
THE SYDAS FLIGHT DATA PROCESSING SYSTEM c06
C. Dupuy (ENERTEC Schlumberger) *In its* Aircraft Integrated Data Systems Feb. 1979 p 215-235 (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

The use of the SYDAS system for the maintenance and safety of aircraft is described. Data from a variety of aircraft types is processed automatically and completely. Unique features of the system include both bit and frame synchronizers. A detailed description of the functions of the system during the data acquisition and reduction phase is given. Author (ESA)

N80-25286# KLM Royal Dutch Airlines, Amsterdam (Netherlands).
THE USE OF AIDS DATA AT KLM c06
R. A. Hartman *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 237-268 (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

A description is given of an aircraft integrated data system that is able to interrogate up to 350 parameters of some 40 aircraft systems. Sampled flight data is recorded and subsequently analyzed by special ground based computer programs. The use of the output of these programs by the engineering and operational departments to investigate incidents, aircraft and flight crew performance, and flight safety is described. Author (ESA)

N80-25287# National Aerospace Lab., Amsterdam (Netherlands).
NAVAIDS CALIBRATION EVALUATION WITH A COMPUTER-CONTROLLED AVIONICS-DATA ACQUISITION SYSTEM c06
F. J. Abbink and R. Krijn *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 289-311 refs (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

A computer system is described that allows the acquisition of aircraft flight data and their use to evaluate the applicability and accuracy of multi-distance measuring equipment positioning. The system was also used as a reference for the calibration of both Doppler and standard VOR stations in the Netherlands and for the calibration of an inertial sensor system. Finally, the system was used for the measurement of air traffic control radar signals. Author (ESA)

N80-25288# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfehrung.
THE RECONSTRUCTION OF FLIGHT PATHS FROM AIDS-DATA WITH THE AID OF MODERN FILTERING METHODS c04
U. Benecke and K. Hurrass *In its* Aircraft Integrated Data Systems Feb. 1979 p 313-326 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

A method is described that allows the reconstruction of the flight path of an aircraft in cases when a modern, airborne, autonomous navigation system is unavailable. The method uses the true airspeed, the heading, the VOR bearing, and the DME distance and applies optimum smoothing techniques. Data from a test flight are used to illustrate the method. Author (ESA)

N80-25289# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany).
AN AUTOMATIC FAULT INDENTIFICATION SYSTEM (AFIS) ON BOARD c06
H. Kalbe and F. Hildebrandt *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 327-344 In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

A device to monitor aircraft systems performance is described. Operation modes include the continuous monitoring of A/C systems, automatic fault identification, trend data sampling, and single signal interrogations. The system is operated onboard and results in improved maintenance activity, reduces the crew workload and leads to increased dispatch reliability.
Author (ESA)

N80-25290# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Rechenzentrum.
PROCESSING OF AIDS FLIGHT RECORDER DATA FOR A QUICK-LOOK WITH THE AID OF A HYBRID SYSTEM c35
H. Hoffmann *In its* Aircraft Integrated Data Systems Feb. 1979 p 34-362 In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

The translation of flight data recorder information into data which are stored in 12 bit words on IBM compatible magnetic tape is described. The translation makes use of a hybrid computer and passes through the following steps: active filtering, use of a one bit analog to digital converter, and change from serial to parallel data. Author (ESA)

N80-25291# General Accounting Office, Washington, D. C.
A DECISION BY THE SECRETARY OF DEFENSE IS NEEDED ON THE AV-8B AIRCRAFT PROGRAM
8 Feb. 1980 25 p

(PB80-143209) Avail: NTIS HC A02/MF A01 CSCL 01C

The estimated cost of the AV-8B aircraft program has increased greatly although little progress has been made in completing its development. Intense competition for Navy aircraft procurement funds between the AV-8B and the F/A-18 aircraft program has created an element of controversy that has caused proponents and opponents to develop strong arguments for and against the capabilities of the AV-8B. The Congress wants it, the Secretary of Defense is undecided, and the Marine Corps remains convinced that the AV-8B will provide it with the most effective close air support through the end of this century. A decision is needed by the Secretary of Defense. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N80-25292 Case Western Reserve Univ., Cleveland, Ohio.
STABILITY OF THE LAMINAR BOUNDARY LAYER ON A BLUNTED PLATE IN SUPERSONIC FLOW Ph.D. Thesis
Mohammad Mehboob Sartaj Khan 1980 251 p
Avail: Univ. Microfilms Order No. 8013846

The method of multiple scales is used to analyze the effects of bluntness on the spatial stability of a laminar supersonic flow over a blunt plate. The mean flow is formed as a composite of the boundary layer flow and the external inviscid flow over the blunted plate using the method of matched asymptotic expansions. The composite is modified to consider swallowing of the streamlines of the entropy layer by the developing boundary layer. Two length scales are identified to describe the nonuniformity associated with the flow normal to the body. One is related to the boundary layer thickness and the other to the thickness of the entropy layer which results from the rotational inviscid flow field produced by the bow shock ahead of the plate. The ratio of the two scales, epsilon, used as the perturbation parameter, is an index of the bluntness effects on the flow field at each streamwise location of the body. The value epsilon $< < 1$ indicates a boundary epsilon $> > 1$, the boundary layer thickness greatly exceeds the thickness of the entropy layer. Dissert. Abstr.

N80-25293 Iowa State Univ. of Science and Technology, Ames.
A TWO-DIMENSIONAL UNSTEADY EULER EQUATION SOLVER FOR FLOWS IN ARBITRARILY SHAPED REGIONS USING A MODULAR CONCEPT Ph.D. Thesis
Richard Glenn Hindman 1980 84 p
Avail: Univ. Microfilms Order No. 8012966

A technique is described for solving supersonic fluid dynamics problems containing multiple regions of continuous flow, each bounded by a permeable or impermeable surface. Region boundaries are, in general, arbitrarily shaped and time dependent. Discretization of such a region for solution by conventional finite-difference procedures is accomplished using an elliptic solver which alleviates the dependence on a particular base coordinate system. Multiple regions are coupled together through the boundary conditions. The technique has been applied to a variety of problems including the shock diffraction and pointed wedge with detached bow shock. Dissert. Abstr.

N80-25294*# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
STUDY OF EXPERIMENTS ON CONDENSATION OF NITROGEN BY HOMOGENEOUS NUCLEATION AT STATES MODELLING THOSE ON THE NATIONAL TRANSONIC FACILITY Final Report
Peter P. Wegener May 1980 58 p refs
(Grant NsG-1612)
(NASA-CR-163217) Avail: NTIS HC A04/MF A01 CSCL 01A

A cryogenic wind tunnel is based on the twofold idea of lowering drive power and increasing Reynolds number by operating with nitrogen near its boiling point. There are two possible types of condensation problems involved in this mode of wind tunnel operation. They concern the expansion from the nozzle supply to the test section at relatively low cooling rates, and secondly the expansion around models in the test section. This secondary expansion involves higher cooling rates and shorter time scales. In addition to these two condensation problems it is not certain what purity of nitrogen can be achieved in a large facility. Therefore, one cannot rule out condensation processes other than those of homogeneous nucleation. E.D.K.

N80-25295*# Grumman Aerospace Corp., Bethpage, N.Y.
TRANSONIC FLOW FIELD ANALYSIS FOR WING-FUSELAGE CONFIGURATIONS Final Report
Charles W. Boppe May 1980 160 p refs
(Contract NAS1-14732)
(NASA-CR-3243) Avail: NTIS HC A08/MF A01 CSCL 01A

A computational method for simulating the aerodynamics of wing-fuselage configurations at transonic speeds is developed. The finite difference scheme is characterized by a multiple embedded mesh system coupled with a modified or extended small disturbance flow equation. This approach permits a high degree of computational resolution in addition to coordinate system flexibility for treating complex realistic aircraft shapes. To augment the analysis method and permit applications to a wide range of practical engineering design problems, an arbitrary fuselage geometry modeling system is incorporated as well as methodology for computing wing viscous effects. Configuration drag is broken down into its friction, wave, and lift induced components. Typical computed results for isolated bodies, isolated wings, and wing-body combinations are presented. The results are correlated with experimental data. A computer code which employs this methodology is described. E.D.K.

N80-25296*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEVELOPMENT AND VALIDATION OF A COMBINED ROTOR FUSELAGE INDUCED FLOW FIELD COMPUTATIONAL METHOD
Carl E. Freeman Jun. 1980 61 p refs Prepared in cooperation with Army Aviation Research and Development Command, St. Louis, Mo.
(NASA-TP-1656; AVRADCOM-TR-80-B-3; L-13363) Avail: NTIS HC A04/MF A01 CSCL 01A

A potential-flow panel method was modified to calculate the effects of a rotor wake on the time-averaged surface pressure and velocity distributions on a helicopter fuselage. The rotor-induced velocities are calculated by using a vortex-tube wake model. The calculated pressure distributions are found to compare well with experimental data obtained from tests of a wind-tunnel model. Author

N80-25297*# Lockheed-Georgia Co., Marietta.
EXPLORATORY STUDIES OF THE CRUISE PERFORMANCE OF UPPER SURFACE BLOWN CONFIGURATIONS. EXPERIMENTAL PROGRAM: TEST FACILITIES, MODEL DESIGN INSTRUMENTATION, AND LOWSPEED, HIGH-LIFT TESTS
J. A. Braden, J. P. Hancock, K. P. Burdges, and J. E. Hackett Washington NASA Jun. 1980 111 p refs
(Contract NAS1-13871)
(NASA-CR-3192; LG77FR0028) Avail: NTIS HC A06/MF A01 CSCL 01A

The model hardware, test faciliteis and instrumentation utilized in an experimental study of upper surface blown configurations at cruise is described. The high speed (subsonic) experimental work, studying the aerodynamic effects of wing nacelle geometric variations, was conducted around semispan model configurations composed of diversified, interchangeable components. Power simulation was provided by high pressure air ducted through closed forebody nacelles. Nozzle geometry was varied across size, exit aspect ratio, exit position and boattail angle. Three dimensional force and two dimensional pressure measurements were obtained at cruise Mach numbers from 0.5 to 0.8 and at nozzle pressure ratios up to about 3.0. The experimental investigation was supported by an analytical synthesis of the system using a vortex lattice representation with first order power effects. Results are also presented from a compatibility study in which a short haul transport is designed on the basis of the aerodynamic findings in the experimental study as well as

acoustical data obtained in a concurrent program. High lift test data are used to substantiate the projected performance of the selected transport design. E.J.R.

N80-25298*# Computational Mechanics Consultants, Knoxville, Tenn.
AN INTERACTION ALGORITHM FOR PREDICTION OF MEAN AND FLUCTUATING VELOCITIES IN TWO-DIMENSIONAL AERODYNAMIC WAKE FLOWS Final Report
A. J. Baker and J. A. Orzechowski Washington NASA Jul. 1980 70 p refs
(Contract NAS1-14855)
(NASA-CR-3301; CoMCo-80-TR-1.0) Avail: NTIS HC A04/MF A01 CSCL 01A

A theoretical analysis is presented yielding sets of partial differential equations for determination of turbulent aerodynamic flowfields in the vicinity of an airfoil trailing edge. A four phase interaction algorithm is derived to complete the analysis. Following input, the first computational phase is an elementary viscous corrected two dimensional potential flow solution yielding an estimate of the inviscid-flow induced pressure distribution. Phase C involves solution of the turbulent two dimensional boundary layer equations over the trailing edge, with transition to a two dimensional parabolic Navier-Stokes equation system describing the near-wake merging of the upper and lower surface boundary layers. An iteration provides refinement of the potential flow induced pressure coupling to the viscous flow solutions. The final phase is a complete two dimensional Navier-Stokes analysis of the wake flow in the vicinity of a blunt-bases airfoil. A finite element numerical algorithm is presented which is applicable to solution of all partial differential equation sets of inviscid-viscous aerodynamic interaction algorithm. Numerical results are discussed. Author

N80-25299*# Aeronautical Research Associates of Princeton, Inc., N. J.
VISCOUS THIN AIRFOIL THEORY Final Report, 1977 - 1980
John E. Yates Feb. 1980 65 p refs
(Contracts NAS1-15936; N00014-77-C-0616)
(NASA-CR-163069; AD-A082744; ARAP-413) Avail: NTIS HC A04/MF A01 CSCL 20/4

The theory of oscillating thin airfoils in incompressible viscous flow is formulated and applied to the calculation of steady and unsteady loads on the family of symmetric Joukowski airfoils. The theory is reduced to the form of an integral equation with kernel function whose solution is obtained with a modal expansion technique familiar from flat plate thin airfoil theory. The effect of viscosity is to change the order of the singularity in the kernel function such that a unique solution is obtained for any cross sectional geometry without using an auxiliary uniqueness criteria like the Kutta condition or principle of minimum singularity. Viscous thin airfoil calculations for an airfoil with sharp trailing edge are in agreement with the results of potential theory with Kutta condition. Viscous thin airfoil steady and unsteady calculations for an airfoil with elliptic cross section are in much better agreement with experimental results. It is concluded that viscous thin airfoil theory is a practical tool for introducing simultaneously the effects of viscosity and geometric thickness in two dimensional unsteady aerodynamic theory. GRA

N80-25300# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik
UNSTEADY PRESSURE MEASUREMENTS AT STALL AND BUFFETING
Peter Bublitz Apr. 1979 52 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-641)
(DFVLR-Mitt-79-09; ESA-TT-641) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 11,80

The fluid dynamics of stall and buffeting and their effects on elastic structures are described. Using a generalized form of the equations of motion and applying Fourier transformation techniques, the dynamical solution and the quantities that govern it are briefly discussed. The experimental apparatus and the measurement method are described in some detail and a few results relating to the measurement of stall on a trapezoidal stalled wing with and without strakes are presented. Author (ESA)

N80-25301# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik
HYPERSONIC SLIP-FLOW AROUND SLENDER ELLIPTIC CONES AT A SLIGHT ANGLE OF ATTACK Ph.D. Thesis - Technische Univ., Aachen
Panajotis Evangelou May 1979 126 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-644)
(DFVLR-FB-79-21; ESA-TT-644) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 19,20

A method is developed for calculating the hypersonic flow around slender elliptic cones at a slight angle of attack. The main equations are derived from the Navier-Stokes equations and energy conservation. The resulting system of partial parabolic differential equations is solved using an explicit finite difference scheme. A comparison is made with experimental data and other theoretical investigations. Author (ESA)

N80-25302# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik
DRAG MEASUREMENTS OF CONICAL AFTERBODIES AT SUBSONIC AND TRANSONIC SPEEDS
Helmut Esch 22 May 1979 65 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-646))
(DFVLR-FB-79-27; ESA-TT-646) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 10,40

The drag of open conical afterbodies of missile bodies was measured at angles of incidence up to 20 deg. The speeds were in the subsonic and lower transonic Mach range at Reynolds numbers, based on body diameter, between 500,000 and 1,300,000. At zero incidence, the results allow a drag optimization for constant afterbody lengths and for constant base diameters. Author (ESA)

N80-25303# National Technical Information Service, Springfield, Va.
AIRCRAFT WAKE VORTICES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Feb. 1980
Guy E. Habercom, Jr. Mar. 1980 288 p Supersedes NTIS/PS-79/0166; NTIS/PS-78/0122; NTIS/PS-77/0067 (PB80-805666; NTIS/PS-79/0166; NTIS/PS-78/0122; NTIS/PS-77/0067) Avail: NTIS HC $30.00/MF $30.00 CSCL 01A

Wake vortices and turbulent flow across aircraft lifting surfaces are investigated in the Government-sponsored research documents. Aerodynamic characteristics of vortices are reviewed with special attention made to trailing aircraft and aviation safety. This updated bibliography contains 281 abstracts, 23 of which are new entries to the previous edition. GRA

N80-25304# National Technical Information Service, Springfield, Va.
AIRCRAFT SONIC BOOM: EFFECTS ON BUILDINGS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Feb. 1980
Guy E. Habercom, Jr. Mar. 1980 82 p Supersedes NTIS/PS-79/0265; NTIS/PS-78/0239; NTIS/PS-77/0219 (PB80-806334; NTIS/PS-79/0265; NTIS/PS-78/0239; NTIS/PS-77/0219) Avail: NTIS HC $30.00/MF $30.00 CSCL 01C

Research findings are cited on the effects of sonic booms on buildings, structural components, forms, windows, and walls. Test house investigations are included, along with damage analysis and vibration response. Documentation is made on residential buildings. Other topics contained in the volume range from theory to failure analysis. Sonic boom propagation and effects on biological forms, including human responses, are cited in separate bibliographies. This updated bibliography contains 75 abstracts, 1 of which is a new entry to the previous edition. GRA

N80-25305# National Technical Information Service, Springfield, Va.
PARACHUTES AND DECELERATORS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1974 - Feb. 1980
Guy E. Habercom, Jr. Apr. 1980 338 p Supersedes NTIS/PS-79/0368; NTIS/PS-78/0320 (PB80-806946; NTIS/PS-79/0368; NTIS/PS-78/0320) Avail: NTIS HC $30.00/MF $30.00 CSCL 01C

Citations describe devices such as towplates, balutes, servoactuators, patented mechanisms, semiautomatic openers, and release systems. Discussions are made of inflatable, supersonic, autorotor, retrorocket, and other structures. Descent characteristics, trajectories, aerodynamic reefing, shroud line and snatch forces, and flare engineering are included. Also presented are materials on flight testing, models, wind tunnel tests, and computer aided design. Applications are to target drone retrieval, air drop and delivery, coastal upwelling, sewage water tracking, and mine ventilation. This updated bibliography contains 332 abstracts, 24 of which are new entries to the previous edition. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation and 85 Urban Technology and Transportation.*

N80-25306*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EQUATIONS FOR DETERMINING AIRCRAFT MOTIONS FOR ACCIDENT DATA
Ralph E. Bach, Jr. and Rodney C. Wingrove Jun. 1980 24 p refs
(NASA-TM-78609; A-7913) Avail: NTIS HC A02/MF A01 CSCL 01C

Procedures for determining a comprehensive accident scenario from a limited data set are reported. The analysis techniques accept and process data from either an Air Traffic Control radar tracking system or a foil flight data recorder. Local meteorological information at the time of the accident and aircraft performance data are also utilized. Equations for the desired aircraft motions and forces are given in terms of elements of the measurement set and certain of their time derivatives. The principal assumption made is that aircraft side force and side-slip angle are negligible. An estimation procedure is outlined for use with each data source. For the foil case, a discussion of exploiting measurement redundancy is given. Since either formulation requires estimates of measurement time derivatives, an algorithm for least squares smoothing is provided. E.D.K.

N80-25307# Simula, Inc., Tempe, Ariz.
AIRCRAFT CRASH SURVIVAL DESIGN GUIDE. VOLUME 2: AIRCRAFT CRASH ENVIRONMENT AND HUMAN TOLERANCE Final Report, Sep. 1977 - Aug. 1979
D. H. Laananen Jan. 1980 11225 p refs Supersedes USAAMRDL-TR-71-22
(Contract DAAJ02-77-C-0021; DA Proj. 1L1-62209-AH-76) (AD-A082512; TR-7820-Vol-2; USARTL-TR-79-22B-Vol-2; USAAMRDL-TR-71-22) Avail: NTIS HC A06/MF A01 CSCL 01/2

Background information is presented to assist designers in developing crashworthy U.S. Army aircraft. Aspects covered include the aircraft crash environment, human tolerance to impact, occupant motion during a crash, anthropometry, and crash test dummies. A.R.H.

N80-25308# Simula, Inc., Tempe, Ariz.
AIRCRAFT SURVIVAL DESIGN GUIDE. VOLUME 5: AIRCRAFT POSTCRASH SURVIVAL Final Report, Sep. 1977 - Sep. 1979
N. B. Johnson and S. H. Robertson Jan. 1980 228 p refs Supersedes USAAMRDL-TR-71-22
(Contract DAAJ02-77-C-0021; DA Proj. 1L1-62209-AH-76) (AD-A082513; TR-7823-Vol-5; USARTL-TR-79-22E-Vol-5; USAMRDL-TR-71-22) Avail: NTIS HC A11/MF A01 CSCL 01/2

The aircraft environment following a crash is described as well as design techniques that can be used to reduce hazards. Topics covered include fires, crashworthy fuel systems, ignition source control, the fire behavior of interior materials, ditching survival, emergency escape, and crash locator beacons. A.R.H.

N80-25309# Civil Aeronautics Board, Washington, D.C. Office of Comptroller.
HANDBOOK OF AIRLINE STATISTICS: SUPPLEMENT Final Report, 1977 - 1978
Paul Gavel, ed. Dec. 1979 195 p
(PB80-138407; CAB-OC-79-01) Avail: NTIS HC A09/MF A01 CSCL 01B

A wide variety of annual traffic, profit and loss, and balance sheet data for each United States Certificated Air Carrier for 1977 and 1978 is presented. Other sections include chronologies of significant events effecting aviation, growth of the airline industry, miscellaneous air transport data, comparisons of air with other modes of transportation as well as carrier group data. It also contains information involving classes of air carriers other than the Certificated Air Carriers. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking and 32 Communications.*

N80-25310 Radio Technical Commission for Aeronautics, Washington, D. C.
MINIMUM PERFORMANCE STANDARDS: AIRBORNE OMEGA RECEIVING EQUIPMENT
21 Sep. 1979 103 p Supersedes DO-164
(RTCA/DO-164A; DO-164) Avail: Radio Technical Commission for Aeronautics, Suite 655, 1717 H Street, N.W., Washington, D.C. 20006

Minimum performance standards for airborne omega receiving equipment are set forth. Incorporated within these standards are system characteristics that are felt to be useful to users of the system as well as designers and manufacturers. Compliance with these standards by manufacturers and users is recommended as a means of assuring that the equipment will satisfactorily perform its intended function under all conditions normally encountered in routine aeronautical operations. In any application of these minimum performance standards due allowance should be made where necessary for equipment in current use which does not fully meet these standards. Inasmuch as the measured values of radio equipment performance characteristics may be a function of the method of measurement, standard test conditions and methods of testing are recommended. E.D.K.

N80-25311 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
GRAVITY MODEL EVALUATION FOR PRECISE TERRESTRIAL INERTIAL NAVIGATION: A SYSTEM ACCURACY APPROACH Ph.D. Thesis
Robert Miles Edwards 1979 291 p
Avail: Univ. Microfilms Order No. 8010664

A statistical analysis technique based on a double integral expression of the navigation system error covariance is developed. Numerical algorithms were formulated to approximate the covariance, and the accuracy and efficiency of these algorithms were compared using a simple Schuler loop example analysis. An algorithm based on a pair of nested, single integrals (nested integrals) was shown to be more efficient than direct approximation of the covariance double integral and was selected for further

development. This nested integrals method was verified against linear state space covariance analysis results on a great circle trajectory and against Monte Carlo results on a hypothetical trajectory for an air-launched strategic missile. A 30:1 computational efficiency advantage over Monte Carlo was demonstrated. The error of linear state space analysis were demonstrated by violating the trajectory restriction. In a final development, the nested integrals algorithm was modified for Kalman filter updates of navigational estimates based on external measurements.
Dissert. Abstr.

N80-25312# Aeronautical Research Labs., Melbourne (Australia).
VISUAL PROBLEMS AND NIGHT LANDING GUIDANCE OF THE CH-47 (CHINOOK) HELICOPTER
B. A. J. Clark Nov. 1979 16 p refs
(ARL/SYS-TM-50; AR-001-781) Avail: NTIS HC A02/MF A01

Improvements and solutions are suggested in the aspects of reflections in transparencies and instrument cover glasses, cockpit lighting, instrument panel layout, and overhead transparencies. The requirements, history, and some brief trials of tactical night landing guidance systems are discussed and possible improvements to present devices and characteristics required of new devices are suggested. Further trials of night landing guidance systems should avoid unnecessary repetition of earlier trials. Improvements to the devices currently in use are necessary to improve operational effectiveness and flight safety. E.D.K.

N80-25313# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
GRAVITY MODEL EVALUATION FOR PRECISE TERRESTRIAL INERTIAL NAVIGATION: A SYSTEM ACCURACY APPROACH Ph.D. Thesis. Final Report, 17 Dec. 1976 - 15 Dec. 1979
Robert M. Edwards Dec. 1979 272 p refs
(AF Proj. 6095)
(AD-A082494; AFAL-TR-79-1231) Avail: NTIS HC A12/MF A01 CSCL 17/7

Inertial navigation has evolved to the point that the traditional gravity model is a principle error source in precise systems. Since future systems may require a more accurate gravity model, a statistical performance evaluation is needed to compare candidate models on realistic scenarios. The present methods of model evaluation are Monte Carlo, which is computationally costly, and linear state space covariance analysis, which has troublesome trajectory and statistical model restrictions. This research developed a new statistical analysis technique based on a double integral expression of the navigation system error covariance. Numerical algorithms were formulated to approximate the covariance, and the accuracy and efficiency of these algorithms were compared using a simple Schuler Loop example analysis.
GRA

N80-25314# Bendix Corp., Baltimore, Md. Communications Div.
MICROWAVE LANDING SYSTEM (MLS), PHASE 3. BASIC NARROW SMALL COMMUNITY CONFIGURATIONS, VOLUME 1 Final Report
Jun. 1978 357 p
(Contract DOT-FA72WA-2801)
(AD-A081233; MLS-BCD-R-2801-1-Vol-1) Avail: NTIS HC A16/MF A01 CSCL 17/7

This report describes the design, fabrication, and testing of a Basic (Narrow) and a Small Community configuration for the Microwave Landing System (MLS). A detailed description of the ground and airborne subsystems and equipments, and a summary of flight test data taken at the National Aviation Facilities Experimental Center (NAFEC) are presented. The sitings of the two configurations at NAFEC are described. A summary of the reliability and maintainability analysis is given; the detailed R M analysis is presented in Volume 2, Appendices B thru E. GRA

N80-25315# Bendix Corp., Baltimore, Md. Communications Div.
MICROWAVE LANDING SYSTEM (MLS), PHASE 3. BASIC NARROW SMALL COMMUNITY CONFIGURATIONS, VOLUME 2: APPENDICES Final Report
Jan. 1978 232 p
(Contract DOT-FA72WA-2801)
(AD-A081133; MLS-BCD-R-2801-1-Vol-2-App) Avail: NTIS HC A11/MF A01 CSCL 17/7

Appendix A describes the design considerations that were applied to the Rotman lenses used in a Basic (Narrow) and a Small Community configuration for the Microwave Landing System. Appendices B thru E contain a detailed reliability and maintainability analysis of the two configurations including the airborne equipments. GRA

N80-25316# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
COLORED MEASUREMENT NOISE DIGITAL PREFILTERING BY AVERAGING
Ranier Froriep Jul. 1979 40 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-640)
(DFVLR-Mitt-79-08; ESA-TT-640) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 8

A digital prefilter is described which is used to increase the alignment speed of an inertial platform with a Kalman filter. The prefilter averages sampled measurement data with correlated noise data. The system operates with minimal storage requirements and only small computational effort. The choice of filter parameters is discussed using simulation techniques.
Author (ESA)

N80-25288# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
THE RECONSTRUCTION OF FLIGHT PATHS FROM AIDS-DATA WITH THE AID OF MODERN FILTERING METHODS
U. Benecke and K. Hurrass *In its* Aircraft Integrated Data Systems Feb. 1979 p 313-326 refs In GERMAN; ENGLISH summary
(For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N80-25317 Southern Methodist Univ., Dallas, Tex.
A STUDY OF THE REINFORCEMENT REQUIRED FOR CUTOUTS IN AIRCRAFT SEMI-MONOCOQUE STRUCTURE Ph.D. Thesis
George Ronald Motley 1980 280 p
Avail: Univ. Microfilms Order No. 8012578

An automated solution procedure was developed which results in substantial savings in time and cost required for static, ultimate strength analysis of cutouts in aircraft monocoque structures. A specialized preprocessor was developed to use with existing software which automatically generates the bulk of the input data. A postprocessor was also developed which evaluates the results, revises member properties, and iterates until a near optimal solution is obtained. A fatigue analysis is also required for most cutout installations. Data to support fatigue analysis were extended by use of finite element methods to cover most common cutout reinforcement configurations. General fatigue design guidelines available in the literature were summarized. A third item to consider in development of any cutout reinforcement is the method of fabrication to be used for individual elements. Decisions should be based on relative costs of the various techniques available. A series of studies based in part on the cost of an actual cutout installation were completed and the results summarized to support future design efforts. Dissert. Abstr.

N80-25318*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LARGE-SCALE WIND-TUNNEL TESTS OF INVERTING FLAPS ON A STOL UTILITY AIRCRAFT MODEL

Terrell W. Feistel and Joseph P. Morelli Jun. 1980 56 p refs (NASA-TP-1696; AVRADCOM-TM-80-A-1; A-7061) Avail: NTIS HC A04/MF A01 CSCL 01C

A unique inverting flap system was investigated on a large scale deflected slipstream model in the Ames 40 by 80 foot wind tunnel. The subject tests utilized 33% chord double-slotted flaps on a low aspect ratio wing that was fully immersed in the propeller slipstream. Evaluation of the flap effectiveness is aided by comparisons with the results of tests of other flap systems on the same twin propeller, twin tail boom STOL utility aircraft mode. No extreme or abrupt force or moment increments were encountered when the flaps were deflected through a wide range, corresponding to the complete retraction/extension spectrum. The lift and descent capability of the inverting flaps compared very favorably with that of the other flap systems that have been tested on this model, including some with much greater mechanical complexity. As expected, the flaps caused large nose down, pitching moment increments at the high lift settings; however, the trimmed characteristics are still competitive with those obtained from the more complicated flap systems. It is believed that these flaps may have promising potential application to the design of relatively simple STOL utility aircraft with improved performance capabilities. In addition, they may merit consideration as retrofits to existing aircraft with less effective flap systems. J.M.S.

N80-25319*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

HIGH-SPEED T-38A LANDING GEAR EXTENSION LOADS

Arthur L. Schmitt Mar. 1980 17 p

(NASA-TM-58226; JSC-16497) Avail: NTIS HC A02/MF A01 CSCL 01C

Testing of T-38A landing gear extension at high speed and high altitude is described. The mechanisms are shown together with peak hydraulic pressure data during landing gear deployment with active and inactive strut door flaps. Results of strain gage measurements of stress on various structural members are included. Author

N80-25320*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

FLIGHT SERVICE EVALUATION OF AN ADVANCED COMPOSITE EMPENNAGE COMPONENT ON COMMERCIAL TRANSPORT AIRCRAFT Quarterly Technical Report, 1 Jan. 1976 - 31 Mar. 1976

15 Apr. 1976 180 p

(Contract NAS1-14000)

(NASA-CR-159286; QTR-3) Avail: NTIS HC A09/MF A01 CSCL 01C

The development and flight evaluation of an advanced composite empennage component is presented. The recommended concept for the covers is graphite-epoxy hats bonded to a graphite-epoxy skin. The hat flare-out has been eliminated, instead the hat is continuous into the joint. The recommended concept for the spars is graphite-epoxy caps and a hybrid of Kevlar-49 and graphite-epoxy in the spar web. The spar cap, spar web stiffeners for attaching the ribs, and intermediate stiffeners are planned to be fabricated as a unit. Access hole in the web will be reinforced with a donut type, zero degree graphite-epoxy wound reinforcement. The miniwich design concept in the upper three ribs originally proposed is changed to a graphite-epoxy stiffened solid laminate design concept. The recommended configuration for the lower seven ribs remains as graphite-epoxy caps with aluminum cruciform diagonals. The indicated weight saving for the current advanced composite vertical fin configuration is 20.2% including a 24 lb growth allowance. The project production cost saving is approximately 1% based on a cumulative average of 250 aircraft and including only material, production labor, and quality assurance costs. E.D.K.

N80-25321*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EXPERIMENTAL AND ANALYTICAL TRANSONIC FLUTTER CHARACTERISTICS OF A GEARED-ELEVATOR CONFIGURATION

Charles L. Ruhlin, Robert V. Doggett, Jr., and Richard A. Gregory (Boeing Commercial Airplane Co., Seattle) Jun. 1980 30 p refs Revised

(NASA-TP-1668; L-13544) Avail: NTIS HC A03/MF A01 CSCL 01C

The flutter model represented the aft fuselage and empennage of a proposed supersonic transport airplane and had an all movable horizontal tail with a geared elevator. It was tested mounted from a sting in the transonic dynamics tunnel. Symmetric flutter boundaries were determined experimentally at Mach numbers from 0.7 to 1.14 for a geared elevator configuration (gear ratio of 2.8 to 1.0) and an ungeared elevator configuration (gear ratio of 1.0 to 1.0). Gearing the elevator increased the experimental flutter dynamic pressures about 20 percent. Flutter calculations were made for the geared elevator configuration by using two analytical methods based on subsonic lifting surface theory. Both methods analyzed the stabilizer and elevator as a single, deforming surface, but one method also allowed the elevator to be analyzed as hinged from the stabilizer. All analyses predicted lower flutter dynamic pressures than experiment with best agreement (within 12 percent) for the hinged elevator method. Considering the model as mounted from a flexible rather than rigid sting in the analyses, had only a slight effect on the flutter results but was significant in that a sting related vibration mode was identified as a potentially flutter critical mode. Author

N80-25322# Texas Univ. at Austin. Dept. of Aerospace Engineering and Engineering Mechanics.

THE INFLUENCE OF BALLISTIC DAMAGE ON THE AEROELASTIC CHARACTERISTICS OF LIFTING SURFACES Interim Report, 1 Feb. 1978 - 31 Jan. 1980

D. S. Scott, J. C. Westkaemper, A. Sigal, and R. O. Stearman Jul. 1979 201 p refs

(Grant AF-AFOSR-3569-78; AF Proj. 2301)

(AD-A082536; AFOSR-80-0220TR) Avail: NTIS HC A10/MF A01 CSCL 20/4

An investigation is carried out to determine whether ballistic damage can seriously degrade the aeroelastic integrity of lifting surfaces on aircraft. A promising aeroelastic failure mechanism is identified that results from the localized drag generated when a lifting surface encounters severe damage to its aerodynamic shape. This damage induced drag is shown to significantly decrease the divergence speed of a generic or statistical fighter wing for certain damage site locations while increasing the flutter speed of the wing. Consequently, a critical damage level exits where divergence becomes the critical aeroelastic instability for a wing which may still have adequate strength and flutter integrity. In view of the very limited information existing on the aerodynamic modeling of damaged lifting surfaces, a combined analytical and experimental modeling study was initiated to investigate the flow field in the vicinity of thru hole type damages on lifting surfaces. GRA

N80-25323*# National Materials Advisory Board, Washington, D. C. Commission on Sociotechnical Systems.

MATERIALS FOR HELICOPTER GEARS Final Report

Oct. 1979 100 p refs Sponsored in part by NASA and DOD

(Contract MDA903-78-C-0038)

(NASA-CR-163068; PB80-153483; NMAB-351) Avail: NTIS HC A05/MF A01 CSCL 01C

Some of the power train transmission gears in helicopter drive systems can become critical components as performance requirements are increased; accordingly, increasing attention must be paid to new alloys in order to obtain required performance reliability and survivability. Candidate advanced alloys, with improved high temperature properties, while increasing the resistance to scoring and scuffing, tend to have lower ductility and fracture toughness. An attempt is made to identify design materials, and process problems and requirements. In addition, it is recommended that the characterization of candidate steels be accelerated; preliminary investigation indicates that new alloys may provide improved capability against surface distress. GRA

N80-25324# General Accounting Office, Washington, D. C.

F/A-18 NAVAL STRIKE FIGHTER: ITS EFFECTIVENESS IS UNCERTAIN

14 Feb. 1980 37 p

(PB80-143225; PSAD-80-24) Avail: NTIS HC A03/MF A01 CSCL 01C

Preliminary tests indicate that the F/A-18 weapon system is superior in a number of areas to the aircraft it is to replace, the F-4, A-4, and A-7. However, until the F/A-18's deficiencies,

including those in its armament systems, are resolved, its effectiveness to perform its missions is uncertain. The General Accounting Office makes a number of recommendations to the Secretary of Defense, including delaying the production rate increase until performance problems are corrected and testing is completed, giving priority attention to the F/A-18's self protection and all-weather capability and reassessing the cost of the program and reporting it to the Congress. GRA

N80-25325# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AIRCRAFT DYNAMIC RESPONSE TO DAMAGED RUNWAYS
Mar. 1980 37 p refs Presented at the 49th Meeting of the Struct. and Mater. Panel, Porz-Wahn, West Germany, Oct. 1979
(AGARD-R-685; ISBN-92-835-1354-1) Avail: NTIS HC A03/MF A01

The potential problems of aircraft dynamic response to damaged and repaired runways were studied. For small aircraft with relatively simple landing gear, the operation over nominal repairs was dominated by rigid body motions of the aircraft. The prediction of these motions was possible and compared reasonably well with experimental data. For larger aircraft or aircraft with large external stores, the prediction of detailed loads in critical areas has met with limited success so far. Since landing gear equations are highly nonlinear, the prediction of aircraft dynamic response required time consuming numerical integrations. Also the behavior of large external stores can be affected by nonlinear effects (such as rigging loads), and both landing gear and external stores nonlinearities are affected by aircraft servicing procedures and by the ambient environment. For individual titles, see N80-25326 through N80-25328.

N80-25326# Air Force Engineering and Services Center, Tyndall AFB, Fla.
RUNWAY SURFACE ROUGHNESS
Lapsley R. Caldwell, Anthony G. Gerardi (AFFDL), and Richard Borowski (AFFTC) *In* AGARD Aircraft Dyn. Response to Damaged Runways Mar. 1980 p 1-18 refs (For primary document see N80-25325 16-05)
Avail: NTIS HC A03/MF A01

The techniques used for analysis of runway surface roughness on an f-4 aircraft are reported. Computer simulations and their results are discussed. These results are compared to test data measured from operation of an f-4 over simulated bomb damage repair. Surface roughness criteria to be used in repairing an airfield after an attack are presented. E.D.K.

N80-25327# British Aerospace Aircraft Group, Weybridge (England).
UK APPROACH TO AIRCRAFT DYNAMIC RESPONSE ON DAMAGED AND REPAIRED RUNWAYS
B. W. Payne, A. E. Dudman (British Aerospace Aircraft Group, Warton, England), B. R. Morris, M. Ormerod (Aeroplane and Armament Experimental Establishment), and C. Brain *In* AGARD Aircraft Dyn. Response to Damaged Runways Mar. 1980 p 19-24 (For primary document see N80-25325 16-05)
Avail: NTIS HC A03/MF A01

The operation of military aircraft from damaged and repaired runways was studied. Mathematical models and associated validation trials were successfully employed to predict the dynamic response of aircraft on damaged and repaired runways and together with engineering support trials allow the operational capability of the aircraft to be defined, provided proper consideration can be given to the variability of the environment and the aircraft. Clearance problems arise from rigid aircraft response in pitch and roll giving rise to high undercarriage loads and/or unacceptable handling problems for the pilot and from flexible structure response leading to high aircraft structure loads, especially for heavy external stores. Considerable simplifications were achieved on those aircraft studied as the critical features came essentially from single degree of freedom responses. E.D.K.

N80-25329# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
PARAMETERS AFFECTING AIRCRAFT PERFORMANCE ON RUNWAYS IN BAD CONDITION
Arnulf Krause, Otto Bartsch, and Gunther Kempe *In* AGARD Aircraft Dyn. Response to Damaged Runways Mar. 1980 p 25-31 refs (For primary document see N80-25325 16-05)
Avail: NTIS HC A03/MF A01

It is postulated that calculations of dynamic response to damaged runways must account for the nonlinearities of the undercarriage. Examples taken from simulations of the F-104G running across AM2 runway repair mats serve to identify the influence of some of these nonlinearities and to discuss possibilities to improve undercarriage performance. The subsequent considerations on structural response of the airframe deal with the validity of models and with cost effective ways of determining aircraft performance on runways in bad condition. E.D.K.

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N80-25329 Radio Technical Commission for Aeronautics, Washington, D. C.
ENVIRONMENTAL CONDITIONS AND TEST PROCEDURES FOR AIRBORNE EQUIPMENT Final Draft
7 Dec. 1979 148 p Supersedes DO-160
(RTCA-309-79/SC135-41; DO-160) Avail: Issuing Activity

A series of standard environmental test conditions and applicable test procedures for airborne equipment is set forth. These tests are to provide a laboratory means of determining the performance characteristics of equipment under environmental conditions representative of those which may be encountered in operation of said equipment. The test conditions and test procedures may be used as a minimum performance specification under environmental conditions which can assure a sufficient degree of confidence in performance during operations. Some of the conditions and procedures are not necessarily applicable to all airborne equipment. The appropriate selection is the responsibility of the writers of the performance standards for the specific airborne equipment. E.D.K.

N80-25330*# Old Dominion Univ. Research Foundation, Norfolk, Va.
SENSOR FOR MEASURING INSTANTANEOUS ANGLE OF ATTACK OF HELICOPTER BLADES Final Report, 13 Jan. 1975 - 31 Jul. 1979
P. S. Barna Jun. 1980 84 p refs
(Grant NsG-1143)
(NASA-CR-3297) Avail: NTIS HC A04/MF A01 CSCL 01D

Systematic investigations were performed on a variety of probes to determine their potential for possible application as sensors attached to helicopter blades to measure both the instantaneous angle of attack as well as the dynamic head during actual flight operations. After some preliminary considerations a sensor of essentially spherical shape, about 30 mm in diameter, was designed. The sensor was provided with three pressure ports, and it housed two pressure transducers required for sensing the prevailing pressures acting outside on the surface. The sensors were subsequently tested in the laboratory under a variety of flow conditions to determine their aerodynamic characteristics. Two series of tests were performed: in the first series the sensor was fixed in space while exposed to steady uniform flow, while in the second series the sensor was made to oscillate, thus simulating the cyclic pitch change of the helicopter blades. While the cyclic pitch frequencies were of about the same magnitude as encountered in flight, the flow velocities during tests fell well below those experienced in a rotating blade. The tests showed that the sensors performed satisfactorily under low subsonic flow conditions with frequencies not exceeding five Hz. Author

N80-25276# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
EXPERIENCES WITH A FLYING DATA RECORDING SYSTEM (FDRS) IN A GERMAN AIRFORCE FIGHTER

BOMBER WING AFTER A TROOP TAIL
H. Harsch *In its* Aircraft Integrated Data Systems Feb. 1979 p 11-26 In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25281# Technische Universitaet, Munich (West Germany). Inst. fuer Flugmechanik und Flugregelun.
RELATIONS FOR A FLIGHT PERFORMANCE COMPUTER
M. Kloster *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 139-150 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25283# Technische Universitaet, Brunswick (West Germany). Inst. fuer Maschinenelemente und Foerdertechnik.
REDUCTION OF MEASURED DATA AND A METHOD OF EARLY DETECTION OF SENSOR BREAKDOWN
G. Dahl *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 169-185 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25284# Civil Aviation Authority, Redhill (England).
DESCRIPTION OF THE BRITISH CIVIL AVIATION AIRWORTHINESS DATA RECORDING PROGRAM
H. D. Ruben *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 187-214 (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25285# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
THE SYDAS FLIGHT DATA PROCESSING SYSTEM
C. Dupuy (ENERTEC Schlumberger) *In its* Aircraft Integrated Data Systems Feb. 1979 p 215-235 (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25286# KLM Royal Dutch Airlines, Amsterdam (Netherlands).
THE USE OF AIDS DATA AT KLM
R. A. Hartman *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 237-268 (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25287# National Aerospace Lab., Amsterdam (Netherlands).
NAVAIDS CALIBRATION EVALUATION WITH A COMPUTER-CONTROLLED AVIONICS-DATA ACQUISITION SYSTEM
F. J. Abbink and R. Krijn *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 269-311 refs (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25289# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany).
AN AUTOMATIC FAULT INDENTIFICATION SYSTEM (AFIS) ON BOARD
H. Kalbe and F. Hildebrandt *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 327-344 In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.*

N80-25331 Cincinnati Univ., Ohio.
A NEW APPROACH IN TURBOMACHINERY FLOW ANALYSIS USING THE FINITE ELEMENT METHOD Ph.D. Thesis
Erian Aziz Baskharone 1979 95 p
Avail: Univ. Microfilms Order No. 8012218

A new approach in analyzing the potential flow in the complicated passages of a turbomachine is presented. The analysis is also generally applicable to a variety of similar problems involving multiply connected domains. The outlines of the solution procedure follow the weighted residual; Galerkin's method combined with different order finite elements. The finite element equations are derived in terms of the velocity potential discrete values as well as localized potential discontinuities associated with the domain multiconnectivity. As a result, neither the flow exit angle nor the circulation around the lifting bodies need to be externally prescribed. Instead, they are determined, along with the velocity potential nodal values, in the finite element solution. The computed results are compared with available experimental data, and also with existing analytical solutions based on conformal transformations. The method was used to analyze single airfoil and cascade flows, and also the three dimensional flow field in a radial turbine scroll. Different finite element discretization models were used to obtain the solution, and to study the effects of the grid size and the order of elements on the solution accuracy, computer size and storage requirements. Dissert. Abstr.

N80-25332*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
ENGINE COMPONENT IMPROVEMENT: PERFORMANCE IMPROVEMENT, JT9D-7 3.8 AR FAN Progress Report, Jan. 1978 - Feb. 1979
W. O. Gaffin 12 Jun. 1980 57 p ref
(Contract NAS3-20630)
(NASA-CR-159806; PWA-5515-114) Avail: NTIS HC A04/MF A01 CSCL 21E

A redesigned, fuel efficient fan for the JT9D-7 engine was tested. Tests were conducted to determine the effect of the 3.8 AR fan on performance, stability, operational characteristics, and noise of the JT9D-7 engine relative to the current 4.6 AR Bill-of-Material fan. The 3.8 AR fan provides increased fan efficiency due to a more advanced blade airfoil with increased chord, eliminating one part span shroud and reducing the number of fan blades and fan exit guide vanes. Engine testing at simulated cruise conditions demonstrated the predicted 1.3 percent improvement in specific fuel consumption with the redesigned 3.8 AR fan. Flight testing and sea level stand engine testing demonstrated exhaust gas temperature margins, fan and low pressure compressor stability, operational suitability, and noise levels comparable to the Bill-of-Material fan. Author

N80-25333*# Pratt and Whitney Aircraft, East Hartford, Conn. Commercial Products Div.
STUDY OF BLADE ASPECT RATIO ON A COMPRESSOR FRONT STAGE Final Report, 28 Oct. 1977 - 28 May 1979
R. F. Behlke, J. D. Brooky, and E. Canal, Jr. Nov. 1980 261 p refs
(Contract NAS3-20809)
(NASA-CR-159556; PWA-5583-58) Avail: NTIS HC A12/MF A01 CSCL 21E

A single stage, low aspect ratio, compressor with a 442.0 m/sec (1450 ft/sec) tip speed and a 0.597 hub/tip ratio typical of an advanced core compressor front stage was tested. The test stage incorporated an inlet duct which was representative of an engine transition duct between fan and high pressure compressors. At design speed, the rotor stator stage achieved a peak adiabatic efficiency of 86.6 percent at a flow of 44.35 kg/sec (97.8 lbm/sec) and a pressure ratio of 1.8. Surge margin was 12.5 percent from the peak stage efficiency point. Author

N80-25334*# AiResearch Mfg. Co., Torrance, Calif.
THERMAL-STRUCTURAL DESIGN STUDY OF AN AIRFRAME-INTEGRATED SCRAMJET Final Report, Jun. 1975 - Dec. 1979
J. J. Killackey, E. A. Katinszky, S. Tepper, A. A. Vuigner, C. C. Wright, and G. G. Stockwell May 1980 228 p refs
(Contract NAS1-13984)

(NASA-CR-159039; AiResearch-78-15442-2) Avail: NTIS HC A11/MF A01 CSCL 21E

The development and evaluation of a design concept for the cooled structures assembly for the Scramjet engine is discussed. Development concepts for engine subsystems and design concepts for the aircraft/engine interface are included. A thermal protection system was defined which makes it possible to attain a life of 100 hr and 1000 cycles, the specified goal. The coolant equivalence ratio at the Mach 10 maximum thermal loading condition is 0.6, indicating a capacity for airframe cooling. The mechanical design is feasible for manufacture using conventional materials. For the cooled structures in a six module engine, the mass per unit capture area is 1256 kg/sq m. The total mass of a six module engine assembly including the fuel system is 1502 kg. E.D.K.

N80-25335*# Detroit Diesel Allison, Indianapolis, Ind.

EXPERIMENTAL DETERMINATION OF UNSTEADY BLADE ELEMENT AERODYNAMICS IN CASCADES. VOLUME 1: TORSION MODE CASCADE Final Report

R. E. Riffel and M. D. Rodvrock Jun. 1980 305 p

(Contract NAS3-20055)

(NASA-CR-159831; EDR-10119-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 21E

A two dimensional cascade of harmonically oscillating airfoils was designed to model a near tip section from a rotor which was known to have experienced supersonic torsional flutter. This five bladed cascade had a solidity of 1.17 and a setting angle of 1.07 rad. Graphite epoxy airfoils were fabricated to achieve the realistically high reduced frequency level of 0.44. The cascade was tested over a range of static pressure ratios approximating the blade element operating conditions of the rotor along a constant speed line which penetrated the flutter boundary. The time-steady and time-unsteady flow field surrounding the center cascade airfoil were investigated. The effects of reduced solidity and decreased setting angle on the flow field were also evaluated. Author

N80-25336# Detroit Diesel Allison, Indianapolis, Ind.

HIGH BYPASS TURBOFAN COMPONENT DEVELOPMENT. PHASE 1: FAN DETAIL DESIGN Final Report, Dec. 1978 - Oct. 1979

D. C. Chapman Wright-Patterson AFB, Ohio AFAPL Dec. 1979 70 p

(Contract F33615-78-C-2014; AF Proj. 3066)

(AD-A082821; DDA-EDR-100; AFAPL-TR-79-2103) Avail: NTIS HC A04/MF A01 CSCL 21/5

The objective of this program is to develop an advanced, small, high bypass turbofan component applicable to an advanced, fuel-efficient engine for a new Air Force primary trainer aircraft. The program consists of two phases. Phase 1 consisted of the preliminary design and life cycle cost analysis of candidate engines. This report documents Phase 2 which was the detail design of the selected fan configuration. Primary design point of the fan is 1.8 pressure ratio at 55.9 lbm/sec flow. At a lower speed, the fan will produce 1.65 pressure ratio at a flow compatible with the GMA500 advanced technology core engine. The resultant engine satisfies all requirements of the contract. The fan stage meets all requirements of Mil E-5007D, including bird ingestion and predicted noise levels are below FAR Part 36 requirements. GRA

N80-25337*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGN AND COLD-AIR TEST OF SINGLE-STAGE UNCOOLED TURBINE WITH HIGH WORK OUTPUT

Thomas P. Moffitt, Edward M. Szanca, Warren J. Whitney, and Frank P. Behning Jun. 1980 18 p refs

(NASA-TP-1680; E-316) Avail: NTIS HC A02/MF A01 CSCL 21E

A solid version of a 50.8 cm single stage core turbine designed for high temperature was tested in cold air over a range of speed and pressure ratio. Design equivalent specific work was 76.84 J/g at an engine turbine tip speed of 579.1 m/sec. At design speed and pressure ratio, the total efficiency of the turbine was 88.6 percent, which is 0.6 point lower than the design value of 89.2 percent. The corresponding mass flow was 4.0 percent greater than design. Author

N80-25338*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COLD-AIR INVESTIGATION OF A 4 1/2 STAGE TURBINE WITH STAGE-LOADING FACTOR OF 4.66 AND HIGH SPECIFIC WORK OUTPUT. 2: STAGE GROUP PERFORMANCE

Warren J. Whitney, Frank P. Behning, Thomas P. Moffitt, and Glen M. Hotz Jun. 1980 16 p refs

(NASA-TP-1688; E-315) Avail: NTIS HC A02/MF A01 CSCL 21E

The stage group performance of a 4 1/2 stage turbine with an average stage loading factor of 4.66 and high specific work output was determined in cold air at design equivalent speed. The four stage turbine configuration produced design equivalent work output with an efficiency of 0.856; a barely discernible difference from the 0.855 obtained for the complete 4 1/2 stage turbine in a previous investigation. The turbine was designed and the procedure embodied the following design features: (1) controlled vortex flow, (2) tailored radial work distribution, and (3) control of the location of the boundary-layer transition point on the airfoil suction surface. The efficiency forecast for the 4 1/2 stage turbine was 0.886, and the value predicted using a reference method was 0.862. The stage group performance results were used to determine the individual stage efficiencies for the condition at which design 4 1/2 stage work output was obtained. The efficiencies of stages one and four were about 0.020 lower than the predicted value, that of stage two was 0.014 lower, and that of stage three was about equal to the predicted value. Thus all the stages operated reasonably close to their expected performance levels, and the overall (4 1/2 stage) performance was not degraded by any particularly inefficient component. E.R.

N80-25339*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STATIC AND TRANSIENT PERFORMANCE OF YF-102 ENGINE WITH UP TO 14 PERCENT CORE AIRBLEED FOR THE QUIET SHORT-HAUL RESEARCH AIRCRAFT

Jack G. McArdle, Leonard Hornysk, and Allan S. Moore Jun. 1980 26 p refs

(NASA-TP-1692) Avail: NTIS HC A02/MF A01 CSCL 21E

An outdoor static test stand was used to measure the steady-state and transient performance of the YF-102 turbofan engine with core airbleed. The test configuration included a bellmouth inlet and a confluent-flow exhaust system similar in size to the quiet short-haul research aircraft (QSRA) exhaust system. For the steady-state tests, the engine operated satisfactorily with core bleed up to 14 percent of the core inlet flow. For the transient tests the engine accelerated and decelerated satisfactorily with no core bleed and with core bleed up to 11 percent of the core inlet flow (maximum tested). For some of the tests the core-bleed flow rate was scheduled to vary with fan discharge pressure, to simulate the QSRA bleed requirements. No stability, surge, stall, overtemperature, combustor flameout, or other operating problems were encountered in any of the tests. Steady-state and transient engine performance data are presented in graphs, and fuel-control trajectories for typical transient tests are shown. A.R.H.

N80-25340*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

PERFORMANCE DETERIORATION BASED ON IN-SERVICE ENGINE DATA: JT9D JET ENGINE DIAGNOSTICS PROGRAM

G. P. Sallee 27 Apr. 1979 185 p refs

(Contract NAS3-20632)

(NASA-CR-159525; PWA-5512-35) Avail: NTIS HC A09/MF A01 CSCL 21E

Results of analyses of engine performance deterioration trends and levels with respect to service usage are presented. Thirty-two JT9D-7A engines were selected for this purpose. The selection of this engine fleet provided the opportunity of obtaining engine performance data starting before the first flight through initial service such that the trend and levels of engine deterioration related to both short and long term deterioration could be more carefully defined. The performance data collected and analyzed included in-flight, on wing (ground), and test stand prerepair and postrepair performance calibrations with expanded instrumen-

tation where feasible. The results of the analyses of these data were used to: (1) close gaps in previously obtained historical data as well as augment the historical data with more carefully obtained data; (2) refine preliminary models of performance deterioration with respect to usage; (3) establish an understanding of the relationships between ground and altitude performance deterioration trends; (4) refine preliminary recommendations concerning means to reduce and control deterioration; and (5) identify areas where additional effort is required to develop an understanding of complex deterioration issues. E.R.

N80-25341# General Electric Co., Lynn, Mass. Aircraft Engine Group.
HIGH BYPASS TURBOFAN COMPONENT DEVELOPMENT. PHASE 2: DETAILED DESIGN Interim Report, 4 Oct. 1978 - 25 May 1979
H. Mauch, T. Oldakowski, and D. Weldon Wright-Patterson AFB, Ohio AFAPL Aug. 1979 139 p
(Contract F33615-78-C-2060; AF Proj. 3066)
(AD-A082753; AFAPL-TR-79-2064) Avail: NTIS HC A07/MF A01 CSCL 21/5

A detailed aerodynamic, aeromechanical and mechanical design of the high bypass turbofan fan stage selected during Phase I of this program was satisfactorily completed. This fan design is the result of aero and aeromechanical iterations and trade-offs which achieved the objectives of meeting aerodynamic performance as well as the life and mechanical considerations of MIL-E-5007D. The resulting fan design compares very closely to the fan originally proposed. GRA

N80-25342# National Technical Information Service, Springfield, Va.
GAS AND STEAM TURBINES, GENERAL: CORROSION AND EROSION, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Feb. 1980
Guy E. Habercom, Jr. Mar. 1980 180 p Supersedes NTIS/PS-79/0248; NTIS/PS-78/0167 and NTIS/PS-77/0084
(PB80-806664; NTIS/PS-79/0248; NTIS/PS-78/0167; NTIS/PS-77/0084) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 21E

Government sponsored research reports relating to the hot corrosion and erosion of gas/steam turbine components are cited in this updated bibliography. Of the 173 abstracts included, 54 are new to the previous edition. GRA

N80-25343# National Technical Information Service, Springfield, Va.
GAS AND STEAM TURBINES, GENERAL: CORROSION AND EROSION. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Feb. 1980
Guy E. Habercom, Jr. Mar. 1980 313 p Supersedes NTIS/PS-79/0249; NTIS/PS-78/0168; and NTIS/PS-77/0085
(PB80-806672; NTIS/PS-79/0249; NTIS/PS-78/0168; NTIS/PS-77/0085) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 21E

General components of gas/steam turbines exposed to corrosive and erosive environments are analyzed in these reports gathered in a worldwide literature survey. This updated bibliography contains 306 abstracts, 46 of which are new entries to the previous edition. GRA

N80-25277# Technische Hochschule, Aachen (West Germany). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.
ENGINE PARAMETER TREND ANALYSIS BY LEADS 200: POSSIBILITIES AND LIMITATIONS
W. Koschel *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 29-55 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25278# Technische Hochschule, Aachen (West Germany). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.
INVESTIGATIONS ON LOCAL FAULT DETECTION AT TURBOJET ENGINES
H. Toenskoetter *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 57-83 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25279# Technische Universitaet, Brunswick (West Germany). Inst. fuer Maschinenelemente und Foerdertechnik.
LOCALIZATION OF FAULTS IN JET ENGINES BY CALCULATION OF COMPONENT CHARACTERISTICS
G. Dahl *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 85-112 refs In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25280# Rolls-Royce Ltd., Bristol (England). Aero Div.
THE ENGINE USAGE MONITORING SYSTEM (EUMS): AN HEURISTIC APPROACH TO COST EFFECTIVE FLIGHT DATA MONITORING AND ANALYSIS
F. Robinson *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 113-138 refs (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

N80-25282# Karlsruhe Univ. (West Germany). Inst. fuer Thermische Stroemungsmaschinen.
CLASSIFICATION OF OPERATING CONDITIONS OF TURBOMACHINES FROM SOLID BORNE SOUND
D. Barschdorf, B. Stuehlen, and W. Mach *In* DFVLR Aircraft Integrated Data Systems Feb. 1979 p 151-168 refs (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-25344*# Oklahoma State Univ., Stillwater. Div. of Engineering, Technology and Architecture.
HANDLING QUALITIES OF LARGE FLEXIBLE CONTROL-CONFIGURED AIRCRAFT Final Technical Report, 1 Jan. 1979 - 30 Jun. 1980
Robert L. Swaim Jun. 1980 13 p refs
(Grant NsG-4018)
(NASA-CR-163206) Avail: NTIS HC A02/MF A01 CSCL 01C

The effects on handling qualities of low frequency symmetric elastic mode interaction with the rigid body dynamics of a large flexible aircraft was analyzed by use of a mathematical pilot modeling computer simulation. An extension of the optimal control model for a human pilot was made so that the mode interaction effects on the pilot's control task could be assessed. Pilot ratings were determined for a longitudinal tracking task with parametric variations in the undamped natural frequencies of the two lowest frequency symmetric elastic modes made to induce varying amounts of mode interaction. Relating numerical performance index values associated with the frequency variations used in several dynamic cases, to a numerical Cooper-Harper pilot rating has proved successful in discriminating when the mathematical pilot can or cannot separate rigid from elastic response in the tracking task. E.D.K.

N80-25345*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASUREMENT OF THE HANDLING CHARACTERISTICS OF TWO LIGHT AIRPLANES
Jun. 1980 80 p refs
(NASA-TP-1636; L-13054) Avail: NTIS HC A05/MF A01 CSCL 01C

A flight investigation of the handling characteristics of two single engine general aviation airplanes, one a high wing and the other a low wing, included a variety of measurements of different characteristics of the airplanes. The characteristics included those of the control systems, performance, longitudinal and lateral responses, and stall motions. Author

N80-25346# Missouri Univ. - Columbia. Coll. of Engineering.
INHERENT ERROR IN ASYNCHRONOUS DIGITAL FLIGHT CONTROLS Final Report, 1 Feb. 1978 - 31 Jul. 1979
Charles Slivinsky and Sudhiporn Patumtawapibal Feb. 1980 129 p refs
(Grant AF-AFOSR-2968-76; AF Proj. 2304)
(AD-A082622; AFOSR-80-0256TR) Avail: NTIS HC A07/MF A01 CSCL 17/7

The design of closed loop, digital flight control systems having dual redundant digital controllers is presented. The digital controllers have the same sample rate but there is a fixed time skew, or offset, between their respective sample times. The input to the plant is the difference between the external input (pilot input) and the output of the first controller. In an extended model the first channel computes two outputs. The first output of the second channel, is used to calculate the error due to the time skew between the two controllers. The second channel computes only one signal. The inherent errors depend on the difference of the second output of the first channel and the output of the second channel. An algorithm estimates the time skew between two asynchronous systems. The application of the extended model in asynchronous redundant digital flight control systems is described. General descriptions, flow charts, user instructions, and listings for all the software are shown. E.D.K.

N80-25347# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT ON THE 54TH(A) PROPULSION AND ENERGETICS PANEL MEETING ON ADVANCED CONTROL SYSTEMS FOR AIRCRAFT POWERPLANTS
J. David Powell (Stanford Univ., Calif.) Mar. 1980 10 p refs
See also AGARD-CP-279
(AGARD-AR-152; ISBN-92-835-1353-3) Avail: NTIS HC A02/MF A01

A survey of the nineteen papers presented and of the discussions which followed each paper given at the meeting is presented as well as conclusions drawn at the Round Table Session. Topics covered include the use of analog electronics, hydromechanics, fluidics, and digital techniques with emphasis on sensors, actuators, redundancy and fault detection. A.R.H.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N80-25348# Committee on Science and Technology (U. S. House).
WATER IMMERSION FACILITY JOHNSON SPACE CENTER
Washington GPO 1979 47 p Hearing before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., no. 73, 96th Congr., 1st Sess., 13 Sep. 1979
(GPO-54-508) Avail: Subcommittee on Space Science and Application

The proposed reprogramming of training facility construction funds needed to complete the construction of the Water Immersion Facility (WIF) is discussed. Details of a failure which occured in the shoring system for the excavation are reported. Results from the failure analysis are outlined and corrective actions are proposed. A number of options for completing the facility were analyzed and the utilization of the existing construction was determined to be the least costly and most expidious plan. Estimates are also given for WIF training costs and costs for training at alternative facilities. A discussion of training options is documented. M.G.

N80-25349# Sandia Labs., Albuquerque, N. Mex.
SIMULATED HAIL TEST FACILITY
D. W. Miller Feb. 1980 25 p refs
(Contract EY-76-C-04-0789)
(SAND-79-1114) Avail: NTIS HC A02/MF A01

A low cost, simulated jail test facility for testing solar mirror and support materials was developed. The facility was designed to be mounted on an existing 54.8 m tower and consists of a 30.5 vertical steel tube, an ice ball transport mechanism, and a release mechanism. It is simple to control and maintain and is convenient for a one man operation. The facility was designed to operate in either a single ball drop mode or a salvo drop mode. Measured velocities of the simulated hail were within 10% of the calculated theoretical terminal velocities of hail in still air for diameters up to 1.9 cm. For larger diameter hail balls, the drop distance is too short to reach terminal velocity.Data generated at this facility aided in the characterization of hail resistant materials for solar applications. Test procedures and alternate methods of hail testing are discussed. DOE

N80-25350# Oak Ridge National Lab., Tenn.
DESIGN OF VIEWING WINDOWS FOR CONTROLLED-ATMOSPHERE CHAMBERS
James N. Robinson Mar. 1980 65 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6864) Avail: NTIS HC A04/MF A01

A guide to the design of safe viewing windows is presented. Design criteria, the properties of materials, the problems of structural design in unreliable materials such as glass, the mathematics of reliability and redundance, and problems associated with testing windows are discussed, and formulas are presented for the design of windows. Criteria adopted at ORNL for controlled atmosphere chambers are presented, a program for surveying and upgrading the safety of existing facilities is described, and the results of this program are reported. DOE

N80-25351# Oak Ridge National Lab., Tenn.
CRITERIA FOR CONTROLLED ATMOSPHERE CHAMBERS
James N. Robinson Mar. 1980 29 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6865) Avail: NTIS HC A03/MF A01

The criteria for design, construction, and operation of controlled atmosphere chambers intended for service at ORNL are presented. Classification of chambers, materials for construction, design criteria, design, controlled atmosphere chamber systems, and operating procedures are presented. DOE

N80-25352# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Entwurfs-Aerodynamik.
EXPERIMENTAL INVESTIGATION OF THE PARTICLE-NUMBER CONCENTRATION IN THE WIND TUNNEL FOR USE OF THE LASER ANEMOMETRY
Harry Bessling, Reinhard Kiock, Christoph Helsper (Gesamthochschule, Duisburg, West Germany), and Heinz Fissan (Gesamthochschule, Duisburg, West Germany) Jun. 1979 49 p refs In GERMAN; ENGLISH summary Report will also be also announced as translation (ESA-TT-647)
(DFVLR-FB-79-28; ESA-TT-647) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 9.30

The conditions under which it becomes possible to measure the velocity of particles in wind tunnels using laser anemometry were studied. Experiments, which were carried out in a high speed cascade wind tunnel, showed that the natural load of particles was insufficient and that the steady addition of an aerosol was necessary to use this method. Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N80-25353*# New Mexico Univ., Albuquerque. Technology Applications Center.
SPACE COLONIES. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Nov. 1979
Gerald F. Zollars Dec. 1979 55 p Sponsored by NASA and NTIS

(NASA-CR-163204; PB80-802960) Avail: NTIS HC $30.00/ MF $30.00 CSCL 22A

Approximately 204 citations to the international literature concerning various aspects of space colonies are presented. Topics include the design and construction of space colonies, the effects on humans of long term life in a variety of spaceborne environments, and the potential uses of orbital space stations and lunar bases. GRA

N80-25354*# Battelle Columbus Labs., Ohio.
SPAR 5 EXPERIMENT NO. 74-30 AGGLOMERATION IN IMMISCIBLE LIQUIDS Final Report
Stan Gelles and A. J. Markworth Jul. 1979 116 p refs
(Contract NAS8-31543)
(NASA-CR-161473) Avail: NTIS HC A06/MF A01 CSCL 22A

The influence of gravity, cooling rate, and composition on the macro-and microstructure of liquid phase immiscible alloys were researched. Aluminum indium alloys of compositions 30, 40, 70, and 90 weight percent indium were processed aboard two sounding rocket flights, SPAR 2 and SPAR 5. Radiographic and metallographic examination of the SPAR 2 flight and ground base samples showed the expected separation at lg of the ground base alloys into indium rich and aluminum rich layers. The flight alloys produced an aluminum rich core surrounding by indium rich metal. The results obtained from the SPAR 5 40 and 70 weight percent indium alloys were essentially identical to those from SPAR 2. The 30 and 90 weight percent indium alloys also showed massive separation into configuration similar to the 40 and 70 weight percent indium alloys. The 90 weight percent indium alloy showed additional evidence that surface tension induced droplet migration had occurred in this alloy which could at least in part account for the observed structures. E.D.K.

N80-25355*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
F-104 LOW-GRAVITY CALIBRATION TESTS FOR MATERIALS PROCESSING IN SPACE PRECURSORY EXPERIMENTS
R. M. Poorman 5 Mar. 1980 11 p
(NASA-TM-78278) Avail: NTIS HC A02/MF A01 CSCL 22A

A precursory low-gravity flight experiment in an F-104 aircraft was conducted to check out the vehicle as a suitable flight test carrier for microgravity experiments. Calibration experiment verification tests in the F-104 were completed. Three flight parabolas were flown. The test data shows all the test parameters recorded by telemetry to have reasonable values. Photographic records are clear and distinct.Solidification modes were the same as those observed in other low gravity environments. The F-104 has been proven to be a useful test bed for low gravity experiments which require less than 60 seconds of low g time. E.D.K.

N80-25356# RAND Corp., Santa Monica, Calif.
COST-EFFECTIVENESS MEASURES OF REPLENISHMENT STRATEGIES FOR SYSTEMS OF ORBITAL SPACECRAFT
Bruce E. Krell Dec. 1979 56 p refs
(Contract F49620-77-C-0023)
(AD-A081859; RAND/N-1295-AF) Avail: NTIS HC A04/MF A01 CSCL 22/1

For many years the U.S. Air Force has employed large-scale, discrete-event digital simulation models for evaluating the cost-effectiveness of various replsnishment strategies for operating satellite systems. The extensive use of computer simulation presupposes a problem complexity intractable to closed form or analytical solutions. This statement is true if analysis requires a great amount of detailed information. This Note demonstrates that there is a level of aggregation of the data inputs at which closed form tractability may be attained. Moreover, given this input aggregation representing failure patterns and replenishment strategies, the exact closed forms for approximating cost-effectiveness are derived. The closed form expressions for the cost-effectiveness of satellite systems are not meant to replace the large-scale simulation programs. The aggregate level measures can bc most effectively employed to check the computer programs for internal consistency and to narrow the focus of acceptable inputs into the large-scale simulation. Proper use of the analytical tools presented herein can reduce the computational effort by significantly reducing the number of simulation runs necessary to identify the most attractive replenishment methods. GRA

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N80-25357*# General Electric Co., Philadelphia, Pa. Space Div.
STUDY OF ADVANCED COMMUNICATIONS SATELLITE SYSTEMS BASED ON SS-FDMA
John Kiesling May 1980 359 p
(Contract NAS3-21745)
(NASA-CR-159778; DOC-80SDS4217) Avail: NTIS HC A16/MF A01 CSCL 22B

A satellite communication system based on the use of a multiple, contiguous beam satellite antenna and frequency division multiple access (FDMA) is studied. Emphasis is on the evaluation of the feasibility of SS (satellite switching) FDMA technology, particularly the multiple, contiguous beam antenna, the onboard switch and channelization, and on methods to overcome the effects of severe Ka band fading caused by precipitation. This technology is evaluated and plans for technology development and evaluation are given. The application of SS-FDMA to domestic satellite communications is also evaluated. Due to the potentially low cost Earth stations, SS-FDMA is particularly attractive for thin route applications up to several hundred kilobits per second, and offers the potential for competing with terrestrial facilities at low data rates and over short routes. The onboard switch also provides added route flexibility for heavy route systems. The key beneficial SS-FDMA strategy is to simplify and thus reduce the cost of the direct access Earth station at the expense of increased satellite complexity. E.D.K.

N80-25358*# Aerospace Corp., Los Angeles, Calif.
COMMUNICATION SATELLITE TECHNOLOGY: STATE OF THE ART AND DEVELOPMENT OPPORTUNITIES
J. B. Woodford, comp. Jul. 1978 275 p refs
(Contract NAS5-24489)
(NASA-CR-159977; ATR-78(7735)-1) Avail: NTIS HC A12/MF A01 CSCL 22B

Opportunities in communication satellite technology are identified and defined. Factors that tend to limit the ready

availability of satellite communication to an increasingly wide group of users are evaluated. Current primary limitations on this wide utilization are the availability of frequency and/or synchronous equatorial satellite positions and the cost of individual user Earth terminals. The former could be ameliorated through the reuse of frequencies, the use of higher frequency bands, and the reduction of antenna side lobes. The latter limitation requires innovative hardware, design, careful system design, and large scale production. E.D.K.

N80-25359# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE ELECTROSTATIC POTENTIAL OF AN EQUATORIAL SATELLITE
Nelitore S. Venkataraman May 1980 12 p refs Revised Submitted for publication
(INPE-1749-RPE/142-Rev) Avail: NTIS HC A02/MF A01

The surface electrostatic potential of a satellite moving with a constant velocity perpendicular to a constant magnetic field was calculated. The ion thermal motion and photoelectric currents were included. Nondimensional parameters were introduced. For large satellites, the nondimentsional potential varies linearly with the nondimensional maximum induced potential. The influence of ion thermal motion photoelectric effect on the satellite potential are of the same order. E.D.K.

N80-25360*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE SOLAR POWER SATELLITE CONCEPTS: THE PAST DECADE AND THE NEXT DECADE
Christopher C. Kraft, Jr. Jul. 1979 22 p Presented at the 15th AIAA Ann. Meeting and Tech. Display, Washington, D.C., 6-8 Feb. 1975 Original contains color illustrations
(NASA-TM-81000; JSC-14898) Avail: NTIS HC A02/MF A01 CSCL 22B

Results of studies on the solar power satellite concept are summarized. The basic advantages are near continuous access to sunlight and freedom from atmospheric effects and cloud cover. The systems definition studies consider photovoltaic and thermal energy conversion systems and find both to be technically feasible, with the photovoltaic approach preferred. A microwave test program is under way which will provide quantitative data on critical parameters, including beam forming and steering accuracy. Ballistic and winged launch vehicles are defined for the transportation of construction materials, with the shuttle expected to provide low cost transportation to and from space. A reference system is outlined for evaluating the concept in terms of environmental and other considerations. Preliminary estimates of natural resource requirements and energy payback intervals are encouraging. E.D.K.

N80-25361# Boston Coll., Chestnut Hill, Mass.
CHARACTERIZATION OF TITAN 3-D ACOUSTIC PRESSURE SPECTRA BY LEAST-SQUARES FIT TO THEORETICAL MODEL Interim Report
Eugene B. Hartnett and Eric Carleen Hanscom AFB, Mass. AFGL Jan. 1980 61 p refs
(Contract F19628-78-C-0008; AF Proj. 7600)
(AD-A083021; SR-2; AFGL-TR-80-0004) Avail: NTIS HC A04/MF A01 CSCL 22/4

A theoretical model for the acoustic spectra of undeflected rocket plumes is fitted to computed spectra of a Titan III-D at varying times after ignition, by a least-squares method. Tests for the goodness of the fit are made. GRA

N80-25362# Syracuse Univ., N. Y.
GEOMETRY OF ORBITING EARTH SATELLITES (GOES) Final Technical Report, Jan. 1978 - Jul. 1979
Jeffrey L. Poodamer Jan. 1980 69 p refs
(Contract F30602-75-C-0121; AF Proj. 0172)
(AD-A082381; RADC-TR-79-357) Avail: NTIS HC A04/MF A01 CSCL 17/8

This report describes the results of a study undertaken to determine if apparent satellite brightness as measured at Earth tracking stations could be used to determine the geometry of the specular reflectors on the orbiting Earth satellite. Specular peaks were identified in the data, sequences of peaks were traced, the maximum peak was identified, and the area and orientation of the maximum peaks were calculated. The output of the specular detection process can be interactively edited to allow translation and rotation of the polygons generated. The process cannot provide unique solutions to the reconstruction problem without some prior knowledge of the object's surface geometry, however. While the feasibility of this approach has been demonstrated, additional work in the areas of simulation, signal processing, and pattern recognition is required. GRA

N80-25363# Argonne National Lab., Ill.
PROCEEDINGS OF THE WORKSHOP ON STRATOSPHERIC AND MESOSPHERIC IMPACTS OF SATELLITE POWER SYSTEMS (SPS)
Dec. 1979 120 p refs Workshop held at Rosemont, Ill., 6-8 Sep. 1978
(Contract W-31-109-eng-38)
(CONF-7809197) Avail: NTIS HC A06/MF A01

Composition perturbations due to rocket exhaust emissions and reentry effects are considered. Climatic effects due to increased noctilucent cloud formation and composition perturbations are also discussed, as well as the effects of localized energy injection, including rocket exhaust thermal energy and microwave absorption. DOE

N80-25364# Battelle Columbus Labs., Ohio.
PRELIMINARY MATERIALS ASSESSMENT FOR THE SATELLITE POWER SYSTEM (SPS)
R. R. Teeter and W. M. Jamieson Jan. 1980 131 p refs
(Contract W-7405-eng-92)
(DOE/ER-0038) Avail: NTIS HC A07/MF A01

Presently, there are two SPS reference design concepts (one using silicon solar cells, the other using gallium arsenide solar cells). A materials assessment of both systems was performed based on the materials lists set forth in the DOE/NASA SPS Reference System Report: Concept Development and Evaluation Program. This listing identified 22 materials used in the SPS. Tracing the production processes for these 22 materials, a total demand for over 20 different bulk materials and nearly 30 raw materials was revealed. Assessment of these SPS material requirements produced a number of potential material supply problems. The more serious problems are those associated with the solar cell materials, and the graphite fiber required for the satellite structure and space construction facilities. In general, the gallium arsenide SPS option exhibits more serious problems than the silicon option, possibly because gallium arsenide technology is not as well developed as that for silicon. DOE

N80-25365# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
EFFECTS OF CONSTRUCTION AND OPERATION OF A SATELLITE POWER SYSTEM UPON THE MAGNETOSPHERE Final Report
Y. T. Chiu, J. G. Luhmann, M. Schulz, and J. M. Cornwall (California Univ., Los Angeles) 1 Dec. 1979 80 p refs Prepared for Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(ATR-80(7824)-1) Avail: NTIS HC A05/MF A01

Exhaust emissions from propulsion and stationkeeping activities of SPS spacecraft induce substantial modifications of magnetospheric processes on both the local and the global scale. This is primarily because of the relatively large mass and energy contents of these emmisions when compared with the total mass and energy contents of the inner magnetosphere. The sources of these emmisions are the argon plasma jet from the solar electric propulsion modules of the cargo orbit transfer vehicle and the H2O neutral exhaust for LO2/LH main engines of the personnel orbit transfer vehicles. Assessment of the SPS scenario, based on presently known physical mechanisms operative in plasma and neutral injection in the magnetosphere, indicates that the major part of the exhaust emmissions are likely to be deposited inside the magnetosphere. DOE

N80-25366# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
A METHOD OF PRODUCING ANALYTICAL ORBIT MODELS FOR GEOSTATIONARY SATELLITES
Martin Eckstein Aug. 1979 31 p refs In GERMAN; ENGLISH

summary Report will also be announced as translation (ESA-TT-643)
(DFVLR-FB-79-16; ESA-TT-643) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 7.30

A simplified perturbation theory of nearly geostationary satellites is described. The analytical form of the perturbations is derived from geometrical considerations and the coefficients are determined using multiple Fourier analysis. The resulting single formula avoids singularities for zero eccentricity and inclination. A computer program is used to evaluate the formula.
Author (ESA)

N80-25367# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
WINDTUNNEL TESTS OF A TUBULAR SUPERSONIC INLET FOR PROJECTILES
Berthold Schaefer Mar. 1979 33 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-645)
(DFVLR-FB-79-26; ESA-TT-645) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 6.30

Measurements were carried out in a trisonic wind tunnel to investigate the sudden increase of drag of a tubular projectile using models with different cowl angles and fineness ratios. The test results show the influence of Mach number, cowl angle, and fineness ratio on the drag coefficient. The Mach number at which the increase in drag occurs is estimated using a simple method.
Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N80-25368* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EPS ANALYSIS OF NOMINAL STS-1 FLIGHT
D. F. Wolfgram and M. D. Pipher May 1980 811 p
(NASA-TM-81001; JSC-16681) Avail: NTIS HC A99/MF A01 CSCL 22B

The results of electrical power system (EPS) analysis of the planned Shuttle Transportation System Flight 1 mission are presented. The capability of the orbiter EPS to support the planned flight and to provide program tape information and supplementary data specifically requested by the flight operations directorate was assessed. The analysis was accomplished using the orbiter version of the spacecraft electrical power simulator program, operating from a modified version of orbiter electrical equipment utilization baseline revision four. The results indicate that the nominal flight, as analyzed, is within the capabilities of the orbiter power generation system, but that a brief, and minimal, current overload may exist between main distributor 1 and mid power controlled 1, and that inverter 9 may the overloaded for extended periods of time. A comparison of results with launch commit criteria also indicated that some of the presently existing launch redlines may be violated during the terminal countdown. E.D.K.

N80-25369*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MCC LEVEL C FORMULATION REQUIREMENTS. ENTRY GUIDANCE AND ENTRY AUTOPILOT, OPTIONAL TAEM TARGETING
J. C. Harpold Apr. 1980 116 p Supersedes JSC-11746
(NASA-TM-81072; JSC-16516; Rept-80-FM-24; JSC-11746) Avail: NTIS HC A06/MF A01 CSCL 22B

The level C software formulations requirements for the entry guidance and the simplified autopilot to be used by the Mission Control Center (MCC) entry processor are presented. The modifications required to functionally simulate optional Terminal Area Energy Management (TAEM) targeting capability (OTT) are incorporated. Implementation of this logic in the MCC must be coordinated with flight software OTT implementation and MCC TAEM guidance OTT. The entry guidance logic is based on the orbiter avionics entry guidance software. Descriptions of the entry guidance detailed formulation requirements, the detailed autopilot formulation requirements, and the targeting routine are given. Also included are a definition of coordinate systems, a list of parameter definitions for the software formulations, and a set of formulation flow charts.
E.D.K.

N80-25370*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MCC LEVEL C FORMULATION REQUIREMENTS. SHUTTLE TAEM TARGETING
Gilbert L. Carman and Moises N. Montez Apr. 1980 86 p
(NASA-TM-80796; JSC-16522; Rept-80-FM-29) Avail: NTIS HC A05/MF A01 CSCL 22B

The level C requirements for the shuttle orbiter terminal area energy management (TAEM) guidance and flight control functions to be incorporated into the Mission Control Center entry profile planning processor are described. This processor is used for preentry evaluation of the entry through landing maneuvers, and includes a simplified three degree-of-freedom model of the body rotational dynamics that is necessary to account for the effects of attitude response on the trajectory dynamics. This simulation terminates at TAEM-autoland interface. E.D.K.

N80-25371*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
STS-1 OPERATIONAL FLIGHT PROFILE. VOLUME 5: DESCENT, CYCLE 3
Richard Moore, Allen Baker, Ralph Hite, Alan Hochstein, Jack Lyons, and Ken Strong May 1980 254 p refs Supersedes T79-12405
(NASA-TM-81077; JSC-14483; Rept-78-FM-51-Vol-5-Rev-1; T79-12405) Avail: NTIS HC A12/MF A01 CSCL 22A

The trajectory data presented are to be used for orbiter systems and subsystems evalation, flight and mission control center software verification, flight techniques and timeline development, crew training, and evaluation of operational mission suitability. The entry profile is very similar to cycle 2, however, elevon and body flap temperature margins have increased and the elevon schedule was changed. The terminal area energy management (TAEM) profile was completely reshaped to conform with new angle of attack constraints and left hand turn around the heading alignment cylinder. Also, the entry/TAEM interface was adjusted to minimize guidance induced angle of attack transients across the interface. The approach and landing phase was reshaped for a 20 deg glideslope and reduced velocity at touchdown. The definition of the runway threshold was standardized for all landing sites. This results in a shift at Edwards Air Force Base in aim points and touchdown relative to the threshold of 1000 feet. The rollout remains essentially unchanged with the exception of the speedbrake, which is now deployed to 50 percent at touchdown.
E.D.K.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-25372*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBITER/SHUTTLE CARRIER AIRCRAFT SEPARATION: WIND TUNNEL SIMULATION, AND FLIGHT TEST OVERVIEW AND RESULTS
D. J. Homan, D. E. Denison (Rockwell International Corp., Downey, Calif.), and K. C. Eichert (Rockwell International Corp., Downey, Calif.) May 1980 88 p ref
(NASA-TM-58223) Avail: NTIS HC A05/MF A01 CSCL 22B

A summary of the approach and landing test phase of the space shuttle program is given from the orbiter/shuttle carrier aircraft separation point of view. The data and analyses used during the wind tunnel testing, simulation, and flight test phases in preparation for the orbiter approach and landing tests are reported. E.D.K.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N80-25373 Princeton Univ., N. J.
NITRAMINE MONOPROPELLANT DEFLAGRATION AND GENERAL NONSTEADY REACTING ROCKET CHAMBER FLOWS Ph.D. Thesis
Moshe Ben-Reuven 1980 355 p
Avail: Univ. Microfilms Order No. 8011031

A steady state deflagration analysis of cyclic nitramines considered as highly energetic components of solid propellant formulations for rocket motors is conducted. An asymptotic theory is advanced for the gaseous deflagration wave, resting upon the difference between the two overall chemical relaxation scales involved. A burning rate formula showing increasing pressure dependence as pressure rises is shown. Linear dependence of the flame speed eigenvalue on pressure is demonstrated, as well as the highly nonlinear coupling between far field and near field processes in the gas and a quantitative measure for the role of condensed phase exothermicity upon the deflagration rate. An erosive burning model, based on coupling through turbulence heat feedback between the core fluid dynamic processes and the wall layer where most of the gaseous chemical reactions occur, is derived. When core wall layer interaction occurs, resulting in burning rate enhancement, residual exothermic reactions may extend to the core. Dynamic coupling of the Rayleigh type between the axial acoustic modes and the residual core exothermicity is demonstrated through natural evolution of oscillations from smooth initial data. Dissert. Abstr.

N80-25374# Los Alamos Scientific Lab., N. Mex.
MODEL OF BURNING AND DETONATION IN ROCKET MOTORS
Charles A. Forest Jan. 1980 29 p refs
(Contract W-7405-eng-36)
(LA-8141-MS) Avail: NTIS HC A03/MF A01

Rocket motor dome failure may produce a damaged porous bed of propellant adjacent to the motor case. This porous bed of propellant may burn and ultimately cause detonation of the motor. A numerical model is presented which examines detonation of the solid propellant grain from shocks induced by the burning porous bed. Calculations are made in one and two dimensional cylindrical geometry and employ the forest fire model of shock induced decomposition. DOE

N80-25375# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
PERFORMANCE PREDICTION OF POWER AUGMENTED ELECTROTHERMAL HYDRAZINE THRUSTERS
D. Hayn, M. Braitinger, and R. H. Schmucker (Bayern-Chem. GmbH, Ottobrun, West Germany) May 1978 10 p refs
(TUM-LRT-KB-78/1) Avail: NTIS HC A02/MF A01

Monopropellant hydrazine propulsion systems are almost exclusively used as auxiliary propulsion systems for satellite orbit and attitude control with large total impulse and long operational life. A detailed analysis of the nozzle flow and the losses including boundary layer, two dimensional flow, and kinetics is presented. The data derived are compared to experimental results. Results show that performance improvement can be achieved by increasing the enthalpy of the hydrazine decomposition productes via an electrical resistive heater so that the gas temperature significantly grows. The performance increase is limited by the maximum tolerable chamber temperature and the conversion of thermal energy into kinetic energy of the exhaust jet. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N80-25376# California Univ., Livermore. Lawrence Livermore Lab. Metals and Ceramics Div.
ADVANCES IN MATERIALS SCIENCE Quarterly Progress Report, Jul. - Sep. 1979
John J. Truhan, ed. and Forest N. Weid, ed. 25 Oct. 1979 64 p refs
(Contract W-7405-eng-48)
(UCRL-50058-79-3) Avail: NTIS HC A04/MF A01

Materials for magnetic fusion energy, laser fusion energy, and Al-air batteries are evaluated. Geothermal energy, oil shale, nuclear waste management, thermochemical cycles for hydrogen production, chemistry, and basic energy science are discussed with reference to the corrosion resistance of materials in the high temperature deg of a double stage flash steam electrical generation system. The corrosion performance of well-casting and piping materials are also discussed. DOE

N80-25377# National Bureau of Standards, Washington, D.C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 85, NO. 1 Bimonthly Report, Jan. - Feb. 1980
1980 75 p
(PB80-146566; LC-62-37059) Avail: NTIS HC A04/MF A01 CSCL 07D

Contents: absolute isotopic abundance and the atomic weight of a reference sample of thallium; enthalpies of dilution of aqueous electrolytes-sulfuric acid, hydrochloric acid, and lithium chloride; standardization of iridium-192 gamma-ray sources in terms of exposure; a practical test of the air density equation in standards laboratories at differing altitude; and publications of the National Bureau of Standards. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N80-25378 Case Western Reserve Univ., Cleveland, Ohio.
FOURIER TRANSFORM INFRARED INVESTIGATION OF THE STRUCTURE AND MOISTURE STABILITY OF THE EPOXY MATRIX IN GLASS-REINFORCED COMPOSITES Ph.D. Thesis
Mitchell Kelly Antoon, Jr. 1980 251 p
Avail: Univ. Microfilms Order No. 8013869

Fourier transform infrared spectroscopy is utilized to clarify both the matrix chemical composition and the physical and chemical effects of moisture exposure on an anhydride-crosslinked epoxy resin. Digital subtraction of spectra obtained during the epoxy/anhydride copolymerization indicate that several modifications of the currently accepted reaction mechanism are required. In addition, results show that the kinetics are diffusion controlled; steady-state concentrations of the active centers are never attained. The composition and extent of cure of the highly crosslinked matrix reinforced with glass cloth may be rapidly calculated regardless of the filler concentration. Such calculations are aided by a factor analysis procedure which determines the number of independently absorbing species in the composite system. The composition of any composite is then determined by fitting the spectra of those species to the composite spectrum by a least squares criterion. Dissert. Abstr.

N80-25379 Duke Univ., Durham, N. C.
CHARACTERIZATION OF FATIGUE DAMAGE MECHANISMS IN CONTINUOUS FIBER REINFORCED METAL MATRIX COMPOSITES Ph.D. Thesis
William Steven Johnson 1979 178 p
Avail: Univ. Microfilms Order No. 8012034

The fatigue damage mechanisms of continuous fiber reinforced metal matrix composites were examined by conducting a series of fatigue tests on various laminates of annealed boron-6061 aluminum. The mechanical stress-strain response of each specimen was recorded at various intervals during the cyclic life in order to determine the changes in various mechanical properties due to fatigue. Each specimen was inspected utilizing a C-scan ultrasonic nondestructive testing technique to screen those specimens with detectable defects such that only the better quality laminate specimens would be evaluated. After failure the specimens were studied microscopically in order to define and document the fatigue damage. Significant results are reported. Dissert. Abstr.

N80-25380*# Vought Corp., Dallas, Tex.
DESIGN AND DEVELOPMENT OF A HARD TUBE FLEXIBLE RADIATOR SYSTEM Final Report
C. W. Hixon 25 Apr. 1980 40 p refs
(Contract NAS9-14776)
(NASA-CR-160663; Rept-2-30320/OR-52416) Avail: NTIS HC A03/MF A01 CSCL 11D

The construction and operational characteristics of an extended life flexible radiator panel is described. The radiator panel consists of a flexible fin laminate and stainless steel flow tubes designed for a 90 percent probability of surviving 5 years in an Earth orbit micrometeoroid environment. The radiator panel rejects 1.1 kW sub t of heat into an environmental sink temperature of 0 F. Total area is 170 square feet and the panel extends 25 feet in the fully deployed position. When retracted the panel rolls onto a 11.5 inch diameter by 52 inch long storage drum, for a final stored diameter of 22 inches. R.C.T.

N80-25381*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
SHORT BEAM SHEAR TESTS OF POLYMERIC LAMINATES AND UNIDIRECTIONAL COMPOSITES Final Report
W. W. Stinchcomb and E. G. Henneke Jun. 1980 33 p refs
(Contract NsG-1254)
(NASA-CR-163239) Avail: NTIS HC A03/MF A01 CSCL 11D

The application of advanced composite materials in aerospace, ground transportation, and sporting industries are discussed. Failure theories for the design and mechanical behavior of composite materials are emphasized. Methods for detecting specific types of flaws are outlined. The effect of detected flaws on mechanical properties such as stiffness, strength, fatigue lifetime, or residual strength is described. R.C.T.

N80-25382*# Hamilton Standard, Windsor Locks, Conn.
DIFFUSION BONDED BORON/ALUMINUM SPAR-SHELL FAN BLADE Final Report, Jun. 1977 - May 1978
C. E. K. Carlson, J. L. Cutler, W. J. Fisher, and J. V. W. Memmott Jun. 1980 114 p refs
(Contract NAS3-20407)
(NASA-CR-159571; HSER-7988) Avail: NTIS HC A06/MF A01 CSCL 11D

Design and process development tasks intended to demonstrate composite blade application in large high by-pass ratio turbofan engines are described. Studies on a 3.0 aspect radio space and shell construction fan blade indicate a potential weight savings for a first stage fan rotor of 39% when a hollow titanium spar is employed. An alternate design which featured substantial blade internal volume filled with titanium honeycomb inserts achieved a 14% potential weight savings over the B/M rotor system. This second configuration requires a smaller development effort and entails less risk to translate a design into a successful product. The feasibility of metal joining large subsonic spar and shell fan blades was demonstrated. Initial aluminum alloy screening indicates a distinct preference for AA6061 aluminum alloy for use as a joint material. The simulated airfoil pressings established the necessity of rigid air surfaces when joining materials of different compressive rigidities. The two aluminum alloy matrix choices both were successfully formed into blade shells. A.R.H.

N80-25383*# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
SUDDEN STRETCHING OF A FOUR LAYERED COMPOSITE PLATE Interim Report
G. C. Sih and E. P. Chen Mar. 1980 42 p refs
(Grant NsG-3197)
(NASA-CR-159870; IFSM-80-102) Avail: NTIS HC A03/MF A01 CSCL 11D

An approximate theory of laminated plates is developed by assuming that the extensional and thickness mode of vibration are coupled. The mixed boundary value crack problem of a four layered composite plate is solved. Dynamic stress intensity factors for a crack subjected to suddenly applied stress are found to vary as a function of time and depend on the material properties of the laminate. Stress intensification in the region near the crack front can be reduced by having the shear modulus of the inner layers to be larger than that of the outer layers. Author

N80-25384*# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
SUDDEN BENDING OF CRACKED LAMINATES Interim Report
G. C. Sih and E. P. Chen Feb. 1980 53 p refs
(Contract NsG-3197)
(NASA-CR-159860; IFSM-80-103) Avail: NTIS HC A04/MF A01 CSCL 11D

A dynamic approximate laminated plate theory is developed with emphasis placed on obtaining effective solution for the crack configuration where the 1/square root of r stress singularity and the condition of plane strain are preserved. The radial distance r is measured from the crack edge. The results obtained show that the crack moment intensity tends to decrease as the crack length to laminate plate thickness is increased. Hence, a laminated plate has the desirable feature of stabilizing a through crack as it increases its length at constant load. Also, the level of the average load intensity transmitted to a through crack can be reduced by making the inner layers to be stiffer than the outer layers. The present theory, although approximate, is useful for analyzing laminate failure to crack propagation under dynamic load conditions. Author

N80-26281# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
IDENTIFICATION OF THE ELASTIC CHARACTERISTICS OF COMPOSITE MATERIALS BY MEANS OF VIBRATION TESTS AND A MODEL OF DISCRETE CONSERVATIVE CALCULATION

Daniel Engrand and Daniel Louis *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 79-90 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 401-409 Original report in FRENCH previously announced as A80-19993 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N80-25385 Texas Univ. at Austin.
ELECTROTHERMAL ATOMIZATION IN ATOMIC ABSORPTION SPECTROMETRY: FUNDAMENTAL CAUSES OF INTERFERENCE EFFECTS AND A STUDY OF AN EXPLODING THIN FILM ATOMIZER Ph.D. Thesis
Robert Howard Eklund 1979 312 p
Avail: Univ. Microfilms Order No. 8009856

Exploding thin films by capacitive discharge was examined as a potential atomizer for atomic absorption spectrometry. Graphite, a good reducing agent, was chosen as the film material because it can be obtained inexpensively in a very pure form. Films were deposited on the inside of either a conical or cylindrical design. Machinable glass ceramic was initially used as a substrate material, but quartz was found to give lower background signals because of lower trace impurities. There were three gases (Ar, He, and air) and 5 pressures were examined. Signal reproducibility was found to be the major limitation in using exploding thin graphite films as an atomizer. The fundamental causes of the interference effects associated with atomic absorption spectrometry were also investigated using a filament atomizer. Data was gathered using steady state and transient modes of operation in order to ascertain the importance of gas phase reactions. There were three basic types of reactions studied: metal oxidant; oxidant scrubbing; and intermetallic formation. Results and considerations are reported. Dissert. Abstr.

N80-25386 Case Western Reserve Univ., Cleveland, Ohio.
RESONANCE RAMAN SPECTROSCOPY OF ADSORBED SPECIES AT SOLID-GAS INTERFACES Ph.D. Thesis
James Frank Bradzil, Jr. 1980 298 p
Avail: Univ. Microfilms Order No. 8013831

Probe molecules were used to study the nature of insulator, semiconductor and metal surfaces and the interactions of the molecules with these surfaces. Probe molecules were chosen which give an intrinsic resonance Raman enhancement and thus provide a high sensitivity for measuring their vibrational spectra. The probe molecules chosen were p-nitrosodimethylaniline and p-dimethylaminoazobenzene. Their resonance Raman and absorption spectra were studied in various solvents and adsorbed on three classes of adsorbents. These three classes were: (1) insulators (SiO_2, Al_2O_3); (2) semiconductors (ZnO, SnO_2, TiO_2); and (3) supported metals on silica (Ag, Pt, Pd). It was found that excellent quality vibrational spectra could be obtained for the adsorbed molecules at very low surface coverages by exciting the Raman in the region of the pi-pi(*) transition for these molecules. Dissert. Abstr.

N80-25387 Texas A&M Univ., College Station.
A STUDY OF REACTIONS IN A TIME-OF-FLIGHT MASS SPECTROMETER Ph.D. Thesis
David Lyle Turner, Jr. 1979 212 p
Avail: Univ. Microfilms Order No. 8012013

Three different reaction systems which occur in the ion source of time-of-flight mass spectrometer were investigated. Two of these systems involved the formation of the ion clusters NO(+) N sub 2 radical and Ar(3). Bond energies were determined for NO(+) N sub 2 radical and Ar(3) as 5.01 + or - 0.08 kcal/mole and 5.08 + or - 0.08 kcal/mole respectively. These bond energies were determined from measurement of the equilibrium constants for the formation reactions of NO(+) N sub 2 radical and Ar(3) at various temperatures. The final system involved a study of vaporization reactions of relatively nonvolatile solids of biological interest. The time-of-flight mass spectrometer was used to determine the masses of the vaporized ions. Several different ion sources were designed, constructed, and tested in order to develop a method of vaporizing the sample molecules intact. Among the vaporization/ionization methods tested were rapid heating of the sample, laser induced vaporization of the sample, and vaporization of the sample with a dc discharge. The results of these tests yielded mass spectra with less fragmentation than those obtained with conventional electron impact ion sources. Dissert. Abstr.

N80-25388 Wisconsin Univ. - Madison.
SURFACE VOLTAMMETRY AND COULOMETRY OF SOLID ELECTRODES Ph.D. Thesis
Gary Alan Mabbot 1979 244 p
Avail: Univ. Microfilms Order No. 8007558

A method was developed and an instrument was designed, built, and characterized for measuring the current and the charge passed in a surface reaction based on the response of an electrode to a very precise staircase potential waveform. This approach resulted in an improvement in the detection limit and the ability to isolate the signal from background processes over cyclic voltammetry and other techniques. The method also permitted the measurement of the total charge passed in oxidizing or reducing a surface group from which the surface concentration was calculated. Surface voltammograms and current time curves estimates of the formal potential and the standard reaction rate were also made. Dissert. Abstr.

N80-25389 Tennessee Univ., Knoxville.
AN ELECTRO-OPTICAL ION DETECTOR FOR SPARK SOURCE MASS SPECTROMETRY Ph.D. Thesis
David Lee Donohue 1979 124 p
Avail: Univ. Microfilms Order No. 8012460

A novel ion detection system for spark source mass spectrometry was developed. Various optical detectors were used in conjunction with the device, including a silicon vidicon TV camera, a linear diode array and a photomultiplier tube. In addition, a signal averager was used to accumulate the data and to provide a convenient means of background subtraction, thus increasing the signal-to-noise ratio. Quantitative data were obtained for three systems, showing different ways in which this detector might be used for chemical analysis. A study of isotope dilution, using the element indium, was performed. Also, fly ash was analyzed for six elements using a method in which separated isotopes were used as internal standards. Finally, the zirconium hafnium system was studied to show whether interelement measurements would be feasible with this detection system. The results of these studies revealed that the channel electron multiplier array, can be used to obtain data with precision and accuracy equal to that of existing detectors. Dissert. Abstr.

N80-25390 Houston Univ., Tex.
REACTION RATE SELF-OSCILLATIONS DURING THE OXIDATION OF HYDROGEN OVER NICKEL Ph.D. Thesis
Zelimir F. Kurtanjek 1979 329 p
Avail: Univ. Microfilms Order No. 8012530

The catalytic oxidation of hydrogen over nickel under conditions for which self-oscillatory states exist is discussed. Oscillatory states were investigated by measurements of: (1) contact potential difference (CPD) between the nickel sample and tungsten, (2) oxygen concentration in effluent, (3) catalyst temperature, and (4) temperature difference between the sample and surrounding gas. The CPD measurements enable monitoring of the surface under reaction conditions and identification of surface species. The reaction was studied in a once-through flow reactor and a recirculating reactor. Several stable surface states were observed. The CPD measurements indicate that the system oscillates between an active state in which oxygen is chemisorbed on a reduced surface and a less active state in which the surface is oxidized. Periodic oscillations were observed when either significant mass or heat transfer limitations existed. A periodic (chaotic) behavior existed when the transport resistances were small. The characteristics of the oscillatory states

became independent of linear gas velocity and residence time of the reactor when the transport limitations were small, indicating that the coupling between the transport and chemical state processes is not the cause of the oscillations. Dissert. Abstr.

N80-25391# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE IMPURITY RESITIVITY OF In DOPED CdS
Antonio Ferreira daSilva Feb. 1980 14 p refs Revised Submitted for publication
(INPE-1685-RPE/116-Rev) Avail: NTIS HC A02/MF A01

The previously developed theory of Matsubara-Toyozawa for impurity bands in doped semiconducotrs was investigated by including the effect of correlation via an alternant-molecular-orbital method in order to calculate the impurity resistivity of CdS:In. Specific results are reported. R.C.T.

N80-25392*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
POLLUTANT EMISSIONS FROM FLAT-FLAME BURNERS AT HIGH PRESSURES
Howard G. Maahs and Irvin M. Miller Jun. 1980 41 p refs
(NASA-TP-1673; L-13550) Avail: NTIS HC A03/MF A01 CSCL 07D

Maximum flame temperatures and pollutant emission measurements for NOx, CO, and UHC (unburned hydrocarbons) are reported for premixed methane air flat flames at constant total mass flow rate over the pressure range from 1.9 to 30 atm and for equivalence ratios from 0.84 to 1.12. For any given pressure, maxima typically occur in both the temperature and NOx emissions curves slightly to the lean side of stoichiometric conditions. The UHC emissions show minima at roughly the same equivalence ratios. The CO emissions, however, increase continually with increasing equivalence ratio. Flame temperature and NOx emissions decrease with increasing pressure, while the opposite is true for the CO and UHC emissions. The NOx data correlate reasonably well as a function of flame temperature only. Four flameholders, differing only slightly, were used. In general, the temperature and emissions data from these four flameholders are similar, but some differences also exist. These differences appear to be related to minor variations in the condition of the flameholder surfaces. Author

N80-25393# National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF EXISTING FLAMMABILITY TEST METHODS BY COMPARISON OF THE FLAMMABILITY CHARACTERISTICS OF INTERIOR MATERIALS Final Report, Oct. 1976 - Jun. 1979
Eldon B. Nicholas Mar. 1980 53 p refs
(FAA Proj. 181-521-100)
(AD-A083137; FAA-NA-79-46) Avail: NTIS HC A04/MF A01 CSCL 21/2

Twenty aircraft materials representing a cross section of the interior of a widebodied passenger compartment were tested by five laboratory test methods for comparability. The methods utilized were radiant panel, rate of heat release, vertical Bunsen burner, limited oxygen index, and thermogravimetric analysis. Correlation of the results obtained were made for ignitability, flame spread, heat release, performance, heat flux exposure, and ranking of materials by performance. Heat release data obtained from the rate of heat release apparatus and the E-162 radiant panel indicate the best correlation for panels. E.D.K.

N80-25394# Virginia Univ., Charlottesville.
CHEMICAL IONIZATION MASS SPECTROMETRY Final Report, 1 Jan. 1974 - 14 Sep. 1979
Donald F. Hunt 30 Jan. 1980 53 p refs
(Grants DAAG29-76-G-0326; DAHC04-74-G-0079)
(AD-A081249; ARO-1911713.1-C; ARO-17293.5-C) Avail: NTIS HC A04/MF A01 CSCL 07/4

Research results presented in this report include new methodology for obtaining mass spectra of thermally labile organics, for generating elemental composition data from low resolution GC/MS mass spectra, for counting protons in organic samples under GC/MS conditions, and for the direct analysis of complex mixtures by triple quadrupole mass spectrometry. Detection limits for organics under electron capture negative ion MS conditions are in the attomole (10 to the minus 18th mole) range. GRA

N80-25395# Virginia Univ., Charlottesville.
CHEMICAL IONIZATION MASS SPECTROMETRY OF NITROAROMATIC VAPORS Final Report, 21 Jan. - 30 Sep. 1976
Charles I. Collins and Donald F. Hunt Nov. 1979 25 p refs
(Contract DAAG53-76-C-0086)
(AD-A081228; MERADCOM-2285) Avail: NTIS HC A02/MF A01 CSCL 07/4

The negative ion chemical ionization mass spectra nitroaromatics using a Townsend discharge ion source are reported. The chemical ionization spectra were determined in the presence of various reagent gases and at various temperatures. A sensitivity study of a chemical ionization mass spectrometry system is included which compares detection limits for nitroaromatic compounds in both positive and negative ion detection modes and provides quantitative data on the detection limits for these and other compounds. These studies illustrate the ability of negative ion chemical ionization mass spectrometry to provide two or three orders of magnitude increase in specific ion current for compounds containing electronegative functional groups. The sensitivity observed in case of nitroaromatics is useful for detection of parent ions and also permits the observation of other ions and their relationship in terms of changes in internal energy. The finding that certain organic molecules will capture low-energy electrons (i.e., less than 1 eV) to form negative ions is expected to be of general interest, since this is a very low energy form of radiation interacting and producing profound changes in organic molecules. Of the types of radiation which interact with organic molecules, low-energy electrons are perhaps the least studied. GRA

N80-25396# Los Alamos Scientific Lab., N. Mex.
THEORETICAL EQUATIONS OF STATE FOR THE RARE GASES
G. I. Kerley and P. M. Henry Jan. 1980 41 p refs
(Contract W-7405-eng-36)
(LA-8062) Avail: NTIS HC A03/MF A01

Theoretical equations of state and related calculations are reported for the rare gases neon, argon, krypton, and xenon. The liquid and vapor phases were computed using a model which is based upon thermodynamic perturbation theory. The fluid model requires an expression for the potential energy of a molecule in the force field of its neighbors; this function is derived from the zero-temperature isotherm of the solid. The solid isotherm was determined from static compression data and statistical atom theory. The solid data were the only experimental information used to construct the liquid model. Comparisons were made with measured isothermal-compression data, sound speeds, vaporization curves, Hugoniots, structure factors, viscosities, and melting curves. DOE

N80-25397# Missouri Univ. - Columbia.
RELATIONSHIP OF THE GEOMETRY OF THE OBSERVED STEADY STATE CHEMICAL CONVERSION RATE TO THE BASIC SURFACE REACTION PROCESS IN ELECTROCHEMISTRY
D. G. Retzloff, B. DeFacio, J. E. Bauman, and P. H. Ragatz 1979 12 p refs Presented at the Conf. on Surface Phys., La Jolla, Calif., 6-19 Aug. 1979
(Contract W-7405-eng-82; Grant DAAG29-77-G-0216)
(ISM-243; CONF-7908108-1) Avail: NTIS HC A02/MF A01

Electrochemical corrosion reactions are used to explain why the usual Tafel Law and its associated model of the surface reactions involved is entirely inadequate to describe the physics of the anodic region of the polarization curve. Results as applied to electrochemical reaction studies of aluminum are described. DOE

N80-25398# Montana State Univ., Bozeman. Dept. of Chemical Engineering.
CATALYTIC HYDROGENATION OF COAL-DERIVED LIQUIDS Interim Report, Sep. - Nov. 1979
Lloyd Berg and F. P. McCandless Dec. 1979 25 p
(Contract EX-76-C-01-2034)
(FE-2034-17) Avail: NTIS HC A02/MF A01

Three catalysts containing molybdenum, cobalt, nickel and/or tungsten on bases of specific surface area, pore volume and pore diameter, were fabricated and partially evaluated. Two of them produced product equaling or exceeding the nitrogen specification. Regeneration via an air burnoff of the deposited carbon was accomplished on all three of the catalysts and a subsequent run with each indicated that activity had been restored. DOE

N80-25398# Sandia Labs., Livermore, Calif.
LASER SPARK IGNITION AND EXTINCTION OF A METHANE-AIR DIFFUSION FLAME
R. W. Schmieder Jan. 1980 22 p refs
(Contract EY-76-C-04-0789)
(SAND-79-8288) Avail: NTIS HC A02/MF A01

Laser sparks have been used to ignite and extinguish a methane/air diffusion flame. Simple shock models of strong explosions and convective transport appear capable of accounting for the probabilities of ignition and extinction as a function of the position of the spark. DOE

N80-25400# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
COMBUSTION RESEARCH Annual Report, 1978
Oct. 1979 43 p refs
(Contract W-7405-eng-48)
(LBL-9809) Avail: NTIS HC A03/MF A01

The various fluid mechanical and chemical processes which are thought to be of critical importance in reducing pollutant formation are described. Principal program areas are the interaction of fluid mechanical turbulence with combustion reactions, important phenomena and pollutant generating processes associated with internal combustion engines, fire safety and flame spread, and diagnostics and formation mechanisms associated with the generation of nitrogen containing pollutants. DOE

N80-25401# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemistry.
THERMOPHYSICAL PROPERTIES OF INORGANIC POLYSULFIDES Progress Report
George J. Janz Dec. 1979 25 p refs
(Contract DE-AC02-79ER-10387)
(COO-10387-01) Avail: NTIS HC A02/MF A01

The data needs for thermophysical properties of selected polysulfides, as required directly or indirectly in the advanced battery development programs were addressed along with the mechanisms of melting of ionic compounds. The research approach is briefly summarized and the accomplishments and status of the three principal tasks that were undertaken in this initial period are reported: preparative chemistry; the MSDCRPI DCS facility; and thermophysical properties measurements. First results for sodium trisulfide for the melting point, the enthalpy of fusion, and entrophy of fusion are 238.7 C, 5538 cal/mol, and 10.83 cal/deg mol. DOE

N80-25402# Argonne National Lab., Ill. Chemical Engineering Div.
THERMOPHYSICAL PROPERTIES OF SODIUM
Joanne K. Fink and Leonard Leibowitz May 1979 421 p refs
(Contract W-31-109-eng-38)
(ANL/CEN/RSD-79-1) Avail: NTIS HC A18/MF A01

The thermophysical properties of sodium are presented and summarized in tabular form for reactor safety studies. Subcooled, superheated and saturated properties are given. DOE

N80-25403# Argonne National Lab., Ill.
THERMAL CONDUCTIVITY MEASUREMENTS AND MOLECULAR ASSOCIATION IN ETHANOL VAPOR
D. J. Frurip, L. A. Curtiss, and M. Blander 1979 20 p refs Presented at 16th Intern. Thermal Conductivity Conf., Chicago, 7-9 Nov. 1979
(Contract W-31-109-eng-38)
(CONF-791134-8) Avail: NTIS HC A02/MF A01

Thermal conductivity measurements on ethanol vapor are reported as a function of temperature (329-419 K) and pressure (100-1800 torr). The thermal conductivity versus pressure plots at constant temperature exhibit strong upward curvature at the lower temperatures and nearly linear increases at the higher temperatures. This enhancement in the thermal conductivity is indicative of the presence of a dimeric species and one or more larger clusters in the vapor. Analysis of the data gave best fits for monomer-dimer-tetramer and monomer-dimer-hexamer models. Quantum mechanical evidence indicates that the tetramer is the most probable associated species larger than the dimer. DOE

N80-25404# California Univ., Livermore. Lawrence Livermore Lab.
SUMMARY AND REVIEW OF HYDROGEN THEORETICAL EQUATION-OF-STATE MODELS AT LAWRENCE LIVERMORE LABORATORY
H. C. Graboske, Jr. and K. L. Wong 1 Feb. 1980 39 p refs
(Contract W-7405-eng-48)
(UCID-18489) Avail: NTIS HC A03/MF A01

A review and analysis of the hydrogen equations of state (EOS) are presented. Careful comparison to experimental data and among EOS's are performed and evaluated. The new hydrogen EOS (EOS95) and its representations produce the best agreement with experimental data and hydrodynamic simulation studies. DOE

N80-25405# Mound Lab., Miamisburg, Ohio.
USE OF MASS SPECTROSCOPY FOR CONTAMINATION CONTROL
Victoria M. Franchetti and Christopher Kinard 3 Mar. 1980 35 p
(Contract EY-76-C-04-0053)
(MLM-2686) Avail: NTIS HC A03/MF A01

The use of mass spectrometric techniques to identify oil contaminants on production materials was investigated. Mass spectrometry was found to have the specificity and sensitivity necessary for both identification and semiquantitation of oil contaminants. A mass spectrometric data file was established for use in identifying oils, adhesives, or other contamination that may be present on surface of production parts. Sample preparation and handling determine the quality of the analysis. Simulated and real problem situations were investigated and compared. DOE

N80-25406# Connecticut Univ., Storrs. Inst. of Water Resources.
METHODS OF EVALUATION OF POTENTIALLY HAZARDOUS ORGANICS IN WATER Technical Completion Report, Sep. 1976 - Sep. 1979
Ralph P. Collins 8 Jan. 1980 15 p ref
(Contract DI-14-34-0001-8007)
(PB80-135122; WB0-02761; OWRT-A-072-CONN(1)) Avail: NTIS HC A02/MF A01 CSCL 07D

A method for fingerprinting of public water supplies for the presence of trace organic pollutants involves the trapping of organic compounds on Tenax GC columns, desorption of the compounds from the column and analysis by gas chromatography. A systematic procedure was devised for the characterization of trace organic pollutants in the Thames River. The process involves solvent extraction, separation into classes of organic compounds, and identification by means of gas chromatography and mass spectrometry. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N80-25407 Stanford Univ., Calif.
MICROWAVE SURFACE IMPEDANCE STUDIES ON COPPER AT LOW TEMPERATURE Ph.D. Thesis
Christopher Allen Waters 1980 101 p
Avail: Univ. Microfilms Order No. 8011725

The surface resistance and reactance was measured by means of the related cavity parameters of quality factor (Q) and resonant frequency respectively. The range of temperature investigated was from 1.6 to 14.0 Kelvin. Changes in resonant frequency with temperature were measured with an accuracy of about

one Hertz at a frequency of 9.120 megahertz, which corresponds to a fractional change in surface reactance of 10 to the minus 5th power. Fractional changes in surface resistance were measured with about 5 x 10 to the minus 4th power accuracy. The cavities were cylindrical, and were usually driven in the transverse electric 011 normal mode. A number of circular endplates and cylindrical bodies made of copper or aluminum were assembled in various combinations to form cavities. In one all copper cavity the frequency, as a function of temperature, has shown a discontinuous change of slope at 3.48 + or - 0.04 Kelvin. Although the shape of this function was influenced by various experimental factors, the temperature of the slope discontinuity was repeatable, and was not affected by adsorbed gas contamination on the cavity walls, or by the substitution of aluminum endplates for copper on one or both ends. Dissert. Abstr.

N80-25408 Cincinnati Univ., Ohio.
A PRESENTATION FOR THE DEFORMATION OF A METAL INCLUDING THE EFFECTS OF STRAIN HARDENING AND RECRYSTALLIZATION Ph.D. Thesis
Anand Deo Narayana 1979 130 p
Avail: Univ. Microfilms Order No. 8012242

A phenomenological constitutive theory is developed to predict the mechanical response of a metal that simultaneously undergoes strain hardening and recrystallization. The constitutive theory is developed within the framework of continuum mechanics and thermodynamics. It is subsequently specialized to successfully predict the mechanical response of copper experiencing dynamic recrystallization. An internal state variables approach to constitutive modeling is used to account for changes in the microstructure. The stored energy of cold work is the key macroscopic parameter used to characterize the microstructure. State variables are introduced to account for the total effect of arbitrary deformation and temperature histories on the microstructure. An analysis of the kinematics of recrystallization leads to a multiplicative decomposition of the total deformation mapping into these successive mappings. The mappings correspond to: (1) deformation associated with geometrical changes into the fully annealed current configuration; (2) a strain-hardening deformation into the current plastic configuration; and (3) an elastic deformation into the current configuration. Dissert. Abstr.

N80-25409 Cincinnati Univ., Ohio.
THE HIGH-TEMPERATURE LOW CYCLE FATIGUE BEHAVIOR OF A NEAR-ALPHA TITANIUM ALLOY Ph.D. Thesis
Paul John Bania 1977 189 p
Avail: Univ. Microfilms Order No. 8012230

The high temperature low cycle fatigue (HTLCF) behavior of the near-alpha Ti-5Al-5Sn-2Zr-2Mo-.25Si titanium alloy was examined, with the primary intent of determining the relative importance of microstructure, test temperature and test frequency. Of the four microstructures examined, two were produced by alpha + beta processing and heat treatment while the remaining two microstructures were produced by beta processing with heat treatments above and below the beta transus. The HTLCF tests were conducted under constant total strain control (R = -1.0) at temperatures of 800 F (426 C), 900 F (482 C) and 1000 F (538 C) and cyclic frequencies of 0.4 cpm (.0067 Hz), 2 cpm (.033 Hz) and 10 cpm (.167 Hz). Results indicate that only microstructure played a significant role in determining HTLCF life. The alpha + beta microstructures were seen to exhibit the best overall HTLCF response with the microstructure containing 50 vol pct primary alpha being slightly superior to the 90 vol pct primary alpha microstructure. Dissert. Abstr.

N80-25410 Case Western Reserve Univ., Cleveland, Ohio.
SECTION SIZE EFFECTS ON TOUGHNESS OF VARIOUS CAST STEELS Ph.D. Thesis
Renato Prado Maino 1980 160 p
Avail: Univ. Microfilms Order No. 8013852

The effect of section size on the toughness behavior of various commonly used cast steels was investigated. The steels included eleven commercial grades that were supplied by different manufactures. The various steels were cast as plates of 1 in, 3 in and 5 in section from a single heat for each lot and fully heat treated at the various foundaries. Specimens were removed from each section size to determine the nil ductility transition temperature from drop weight tests, the Charpy V-notched transition curve, tensile properties and microstructure. The primary effect of mass observed was on the fracture toughness of the thicker plates of the quenched and tempered steels. The nil ductility transition temperature increases an average of 22 F (12 C) and 27 F (15 C) in the 3 in and 5 in sections respectively compared to the 1 in thickness. A similar increase occurred in the 15 ft lb and 50 percent fibrosity temperatures of the Charpy test in these quenched and tempered steels. Other significant observations are reported. Dissert. Abstr.

N80-25411 Minnesota Univ., Minneapolis.
SPUTTERING OF MULTICOMPONENT SURFACES: SURFACE COMPOSITION CHANGES UNDER ION BOMBARDMENT AND ANGULAR EJECTION DISTRIBUTIONS OF SPUTTERED SPECIES Ph.D. Thesis
Rolf Robert Olson 1979 115 p
Avail: Univ. Microfilms Order No. 8011863

The sputtering of multicomponent materials is discussed with respect to composition changes at the target surface induced by the ion bombardment and the angular ejection distributions of the sputtered species. Results are shown for several elements and alloys at various bombardment energies. A model is presented which suggest that the phenomenon is a result of reflective collisions because lighter atoms can be backscattered from heavier ones underneath but not vice versa. Dissert. Abstr.

N80-25412*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF HOT CORROSION BEHAVIOR OF THERMAL BARRIER COATINGS
P. E. Hodge, R. A. Miller, and M. A. Gedwill 1980 11 p refs
Presented at Intern. Conf. on Met. Coatings, San Diego, Calif., 21-25 Apr. 1980
(Contract EF-77-A-01-2593)
(NASA-TM-81520; DOE/NASA/2593-16) Avail: NTIS HC A02/MF A01 CSCL 07D

Calcium silicate and yttria stabilized zirconia/MCrAlY thermal barrier coating systems on air-cooled specimens were exposed to sodium plus vanadium doped Mach 0.3 combustion gases. Thermal barrier coating endurance was determined to be a strong inverse function of ceramic coating thickness. Coating system durability was increased through the use of higher Cr + Al NiCrAl and CoCrAlY bond coatings. Chemical and electron microprobe analyses supported the predictions of condensate compositions and the determination of their roles in causing spalling of the ceramic coatings. Author

N80-25413*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EVALUATION OF THE STRESS CORROSION CRACKING RESISTANCE OF SEVERAL HIGH STRENGTH LOW ALLOY STEELS
T. S. Humphries and E. E. Nelson May 1980 28 p refs
(NASA-TM-78276) Avail: NTIS HC A03/MF A01 CSCL 11F

The stress corrosion cracking resistance was studied for high strength alloy steels 4130, 4340, for H-11 at selected strength levels, and for D6AC and HY140 at a single strength. Round tensile and C-ring type specimens were stressed up to 100 percent of their yield strengths and exposed to alternate immersion in salt water, salt spray, the atmosphere at Marshall Space Flight Center, and the seacoast at Kennedy Space Center. Under the test conditions, 4130 and 4340 steels heat treated to a tensile strength of 1240 MPa (180 ksi), H-11 and D6AC heat treated to a tensile strength of 1450 MPa (210 ksi), and HY140 (1020 MPa, 148 ksi) are resistant to stress corrosion cracking because failures were not encountered at stress levels up to 75 percent of their yield strengths. A maximum exposure period of one month for alternate immersion in salt water or salt spray and three months for seacoast is indicated for alloy steel to avoid false indications of stress corrosion cracking because of failure resulting from severe pitting. A.R.H.

N80-25414*# Martin Marietta Aerospace, New Orleans, La.
STUDY OF ETCHANTS FOR CORROSION-RESISTANT METALS, SPACE SHUTTLE EXTERNAL TANK
J. R. Simmons 11 Jan. 1980 26 p refs
(Contract NAS8-30300)

(NASA-CR-161431; ETTR-52) Avail: NTIS HC A03/MF A01 CSCL 11F

Acceptable etchant concentrations and application and removal procedures for etching austenitic stainless steel, nickel base alloys, and titanium alloys (annealed) employed on the external tank were formulated. The etchant solutions were to be capable of removing a minimum of 0.4 mils of surface material in less than one hour. R.C.T.

N80-25415*# IIT Research Inst., Chicago, Ill. Materials Technology Div.

THERMAL FATIGUE AND OXIDATION DATA OF OXIDE DISPERSION-STRENGTHENED ALLOYS

K. E. Hofer, V. L. Hill, and V. E. Humphreys Mar. 1980 42 p refs

(Contract NAS3-17787)

(NASA-CR-159842; IITRI-M6001-82) Avail: NTIS HC A03/MF A01 CSCL 11F

Thermal fatigue and oxidation data were obtained 24 specimens representing 9 discrete oxide dispersion-strengthened alloy compositions or fabricating techniques. Double edge wedge specimens, both bare metal and coated for each systems, were cycled between fluidized beds maintained at 1130 C with a three minute immersion in each bed. The systems included alloys identified as 262 in hardness of HRC 38; 264 in hardness of HRC 38, 40 and 43; 265 HRC 39, 266 of HRC 37 and 40; 754; and 956. Specimens in the bare condition of 265 HRC 39 and 266 HRC 37 survived 6000 cycles without cracking on the small radius of the double edge wedge specimen. A coated specimen of 262 HRC 38, 266 HRC 37 and 266 HRC40 also survived 6000 cycles without cracking. A duplicate coated specimen of 262 HRC 38 alloy survived 5250 cycles before cracks appeared. All the alloys showed little weight change compared compared to alloys tested in prior programs. Author

N80-25416# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics.

THE RATE (TIME)-DEPENDENT BEHAVIOR OF Ti-7Al-2Cb-1Ta TITANIUM ALLOY AT ROOM TEMPERATURE UNDER QUASISTATIC MONOTONIC AND CYCLIC LOADING

D. Kujawski and E. Krempl Dec. 1979 41 p refs

(Contract N00014-76-C-0231)

(AD-A082623; RPI-CS-79-5) Avail: NTIS HC A03/MF A01 CSCL 11/6

Uniaxial tests using a servocontrolled testing machine and strain measurement at the gage length were performed on a high-strength, low-ductility, titanium alloy. Tests involved monotonic and cyclic loadings with strain rates between 2 x 10 to the minus 8th power to 10 to the minus 3rd power s to the minus 1st power, stress rates from 10 to the minus 1st power to 100 MPa s to the minus 1st power and short-term relaxation and creep tests. The inelastic behavior is strongly rate-dependent. Ratchetting is shown to increase as the stress rate decreases. No strain-rate history effect was found. A unique stress-strain curve is ultimately reached for a given strain rate irrespective of prior history as long as only positive stresses are imposed. In the plastic range the relaxation drop in a given time period depends only on the strain rate preceding the test and is independent of the actual stress and strain. The results are qualitatively in accordance with the viscoplasticity theory based on total strain and overstress. GRA

N80-25417# Rockwell International Corp., Thousand Oaks, Calif.

INFLUENCE OF ALPHA/BETA INTERFACE PHASE ON FRACTURE TOUGHNESS AND FATIGUE CRACK GROWTH RATE IN Ti-6Al-4V Technical Report, 1 Feb. 1978 - 31 Jan. 1979

C. G. Rhodes Feb. 1980 25 p refs

(Contract N00014-76-C-0598; NR Proj. 031-790)

(AD-A082456; SC5056.5TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

The alpha/beta interface phase is a microstructural feature which occurs in two-phase, alpha/beta titanium alloys under certain processing conditions. Interface phase can grow to widths of up to approx. 500 nm and has been shown to exert an influence on tensile properties. In this work, its influence on fracture toughness and fatigue crack growth rate in Ti-6Al-4V has been examined. GRA

N80-25418# Lockheed-California Co., Burbank.

INVESTIGATION OF THE MECHANICAL AND CORROSION PROPERTIES OF MA-87 ALUMINUM POWDER ALLOY Final Report

Roy W. Brodie and Leon Bakow Dec. 1979 103 p refs

(Contract N62269-78-C-0446; WF54591001)

(AD-A082457; LR-29293; NADC-78185-60) Avail: NTIS HC A06/MF A01 CSCL 11/6

Mechanical, corrosion and fracture properties were determined for two MA87(CT91)-T7E69 powder alloy extruded shapes. Four lots of material were extruded and heat treated in production facilities. Mechanical properties including tensile, compression, shear and bearing were comparable to available data for 7075-T6 extrusions. The MA87(CT91)-T7E69 extrusions were resistant to exfoliation when exposed to EXCO, salt spray, or sea coast environments, although pitting was observed. GRA

N80-25419# Westinghouse Research and Development Center, Pittsburgh, Pa.

STUDY TO OPTIMIZE Cr-Mo STEELS TO RESIST HYDROGEN AND TEMPER EMBRITTLEMENT Annual Report

B. J. Shaw and E. W. Johnson 17 Dec. 1979 40 p refs

(Contract ET-78-C-01-3050)

(RR-79-9D9-HYTEM-R3; AR-1) Avail: NTIS HC A03/MF A01

Temper embrittlement and hydrogen embrittlement characteristics of 2-1/4 Cr-1 Mo steels are described and the most significant tests performed in H2S are outlined. The testing procedure developed to evaluate the hydrogen embrittlement susceptibility is presented along with the estimates of the crack arrest stress intensities measured on retempered commercial steels. DOE

N80-25420# Rocketdyne, Canoga Park, Calif. Energy Systems Group.

FORGING EVALUATION OF 304L STAINLESS STEEL

C. L. Packard and C. M. Edstrom 29 Oct. 1979 64 p refs

(Contracts EY-76-C-04-3533; DE-AC04-76DP-03533)

(RFP-2897) Avail: NTIS HC A04/MF A01

The effects of various forging parameters on the metallographic structure and mechanical properties of 304L stainless steel forgings were evaluated. Upset and die forgings were produced by hammer and Dynapak forging with forging temperatures ranging from 760 to 1145 C, upset reductions ranging from 20 to 60 percent, and annealing times ranging from 0 to 25 minutes at 843 C. The carbide precipitation behavior observed was found to be a function of forging temperature and annealing time. Higher forging temperatures were beneficial in avoiding continuous carbide precipitation and annealing at 843 C promoted increased carbide precipitation. The yield strength of the unannealed forgings decreased with increasing forging temperature and, with the exception of the 1145 C upset forgings, was significantly lowered by annealing. DOE

N80-25421# Westinghouse Research and Development Center, Pittsburgh, Pa. Research and Development Center.

STUDY TO OPTIMIZE Cr-Mo STEELS TO RESIST HYDROGEN AND TEMPER EMBRITTLEMENT

B. J. Shaw and E. Johnson 23 Aug. 1979 17 p refs

(Contract ET-78-C-01-3050)

(FE-3050-T2; QR-3) Avail: NTIS HC A02/MF A01

Hydrogen sulfide environmental tests on a 2-1/4 Cr-1 Mo sample are presented. The present emphasis is on modifying a testing technique for low yield strength steels (by approximately 100 ksi) in which plane stress-plane strain and incubation time problems are severe. It is demonstrated that the plane stress zones pin the crack and that these zones can be eliminated by side grooving the specimen. The incubation time is reduced by pre-fatiguing in the environment. The reasons for using an arrest stress intensity value, from a simulated bolt load test (K/sub arr/), rather than a crack onset K, form a rising load test (K sub o) for an assessment of hydrogen embrittlement susceptibility are given. It is shown in this sample that a smooth sided 3T specimen has a 150 ksi in/sup 1.2/ whereas a side grooved

2T specimen has a K/sub arr/ approximately 20 ksi in/ sup 1/2/. DOE

N80-25422# Du Pont de Nemours (E. I.) and Co., Aiken, S. C.
NOTCH AND HYDROGEN EFFECTS ON SENSITIZED 21-6-9 STAINLESS STEEL
G. R. Caskey, Jr. 1979 18 p refs Presented at the TMS-AIME Fall Meeting, Milwaukee, 16-20 Sep. 1979
(Contracts EY-76-C-09-0001; AT(07-2)-1)
(DP-MS-79-22; CONF-790910-5) Avail: NTIS HC A02/MF A01

Type 21-6-9 stainless steel alloy is slightly notch sensitive in the solution annealed condition, a behavior that is aggravated by sensitization anneal at 920 K. The lower toughness of the sensitized alloy is a measure of microstructural embrittlement associated with carbide precipitation in grain boundaries. The tendency toward grain boundary fracture in the sensitized alloy is accentuated by stress concentration at the notch. Also, there is an increase in notch sensitivity when the alloy is tested in a high pressure (69 MPa) hydrogen environment, due to susceptibility of the grain boundaries to hydrogen embrittlement. DOE

N80-25423# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
THERMO-MECHANICAL PROCESS FOR TREATMENT OF WELDS Final Report
R. K. Malik Mar. 1980 24 p refs Presented at the WESTEC 80 Conf., Los Angeles, 20 Mar. 1980
(Contracts EY-76-C-07-1570)
(CONF-800316-2) Avail: NTIS HC A02/MF A01

Benefits from thermomechanical processing (TMP) of austentic stainless steel weldments, analogous to hot isostatic pressing (HIP) of castings are examined. It is shown that TMP improves ultrasonic inspectability of austenitic stainless steel welds owing to: conversion of cast dendrites into equiaxed austenitic grains; reduction in size and number of stringers and inclusion; and reduction of delta ferrite content. It is also shown that TMP induces structural homogenization and healing of void type defects and thus contributes to an increase in elongation, impact strength, and fracture roughness as well as a significant reduction in data scatter for these properties. Results indicate that an optimum temperature for TMP or HIP of welds is one which causes negligible grain growth and an acceptable reduction in yield strength, and permits healing of porosity. DOE

N80-25424# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
SOLIDIFICATION BEHAVIOR OF AUSTENITIC STAINLESS STEEL FILLER METALS
S. A. David, G. M. Goodwin, and D. N. Braski Feb. 1980 27 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7116) Avail: NTIS HC A03/MF A01

Thermal analysis and interrupted solidification experiments were conducted on selected austenitic stainless steel filler metals to provide an understanding of the solidification behavior of austenitic stainless steel welds. The sequences of phase separations found were for type 308 stainless steel filler metal and for type 310 stainless steel filler metal. In type 308 stainless steel filler metal, ferrite at room temperature was identified as either the untransformed primary delta-ferrite formed during the initial stages of solidification or the residual ferrite after Widmanstaetten austenite precipitation. Microprobe and scanning transmission electron microscope microanalyses revealed that solute extensively redistributes during the transformation of primary delta-ferrite to austenite, leading to enrichment and stabilization of ferrite by chromium. The type 310 stainless steel filler metal investigated solidifies by the primary crystallization of austenite, with the transformation going to completion at the solidus temperature. DOE

N80-25425# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
HYDROGEN CHARGING EFFECT ON CREEP OF PURE IRON
J. Nagakawa, K. S. Shin, C. G. Park, and M. Meshii 1979 4 p refs Presented at the 2nd Intern. Symp. on Hydrogen in Metals, Minikama Spa, Japan, 26 Nov. 1979; sponsored by Japan Inst. of Metals
(Contract EY-76-S-02-1367; Grant NSF DMR-79-80847)
(COO-1367-107; CONF-791132-4) Avail: NTIS HC A02/MF A01

The cathodic charging effect on mechanical properties of pure iron was examined using creep test. Single and polycrystal specimens prepared from MRC VP grade iron were purified in the ZrH2 system. While no effect was observed for the anodic potential, cathodic charging (approximately 5 volt, approximately 50 A/m(2)) increased the creep rate approximately 30 fold at 200 K. While the creep acceleration was equally prominent in both specimens, the hydrogen embrittlement occurred only in polycrystal specimens. DOE

N80-25426# Massachusetts Inst. of Tech., Cambridge. Nuclear Reactor Lab.
ALLOY DEVELOPMENT FOR IRRADIATION PERFORMANCE IN FUSION REACTORS Annual Report, Sep. 1978 - Sep. 1979
Dec. 1979 113 p refs
(Contract ER-78-S-02-5098)
(COO-5098; MIT-NRL-003) Avail: NTIS HC A06/MF A01

The development of improved performance alloys for each severe environments as the fusion reactor fist wall are described. Major emphasis is directed toward definition of alloy performance requirements, alloy design, alloy production and alloy performance evaluation. Integrated testing and modeling procedures are developed to minimize testing requirements. Progress during the first project year and future plans are summarized. DOE

N80-25427# Illinois Univ., Urbana.
ANELASTIC STUDIES OF INTERSTITIALLY TRAPPED HYDROGEN IN NIOBIUM Ph.D. Thesis
Philip Emerson Zapp 1979 139 p refs
(Contracts DE-AC02-76ER-01198; EY-76-C-02-1198)
(DOE/ER-01198/1299) Avail: NTIS HC A07/MF A01

The trapping and quantum mechanical motion of hydrogen were investigated in Nb-O-H and Nb-N-H by anelastic relaxation. The measured relaxations were caused by the local, stress induced reorientation of single H atoms bound to single, essentially immobile O and N atoms. The symmetries and binding enthalpies of O-H pairs were studied in oriented single crystals of high-purity Nb using pulse-echo attenuation of very high frequency longitudinal stress waves between 100 and 300 K. Well defined internal friction peaks were found in the <100>, <110>, and <111> directions of the of the b.c.c. lattice. Temperature dependence of the jump frequency of H below 100 K was studied in the Nb-N-H system using lower frequency methods. Internal friction peaks were measured, relaxation times were calculated from strain relaxation measurement below 60 K. Data show marked deviation from classical thermally activated Arrhenius behavior. DOE

N80-25428# Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
LOW-TEMPERATURE HELIUM EMBRITTLEMENT OF TRITIUM-CHARGED STAINLESS STEEL
D. E. Rawl, Jr., G. R. Caskey, Jr., and J. A. Donovan 1980 25 p refs Presented at 109th Ann. AIME Meeting, Las Vegas, 24-28 Feb. 1980 Prepared in cooperation with Massachusetts Univ., Amherst
(Contracts EY-76-C-09-0001; DE-AC09-76SR-00001)
(DP-MS-79-64; CONF-800205-4) Avail: NTIS HC A02/MF A01

Specimens of Type 21-6-0 stainless steel were charged with tritium or protium to determine the effect of hydrogen isotope exposure on ductility. Specimens charged with either tritium or protium showed a 40% loss in ductility when tested immediately after charging. Protium-charged specimens stored 5.5 years at 250 K showed no additional loss in ductility. However, tritium-charged specimens suffered an additional loss of 86% in ductility when similarly stored. DOE

N80-25429# Bendix Corp., Kansas City, Mo.
THERMAL FATIGUE EVALUATION OF SOLDER ALLOYS Final Report
D. M. Jarboe Feb. 1980 33 p refs
(Contracts EY-76-C-04-0613; DE-AC04-76DP-00613)

(BDX-613-2341) Avail: NTIS HC A03/MF A01

The relative thermal fatigue resistance of 29 solder alloys was determined. A number of these alloys were found to be less susceptible to thermal fatigue cracking in encapsulated printed wiring board applications than the commonly used tin-lead eutectic (63Sn-37Pb). Three alloys, 95Sn-5Ag, 96.5Ag, and 95Sn-5S offered the greatest resistance to thermal fatigue. The selection of the encapsulation materials was confirmed to be a significant factor in thermal fatigue of solder joints, regardless of the solder alloy used. DOE

N80-25430# Ames Lab., Iowa.

HIGH TEMPERATURE CORROSION STUDIES. A. IRON: BASED SUPERALLOY IN SO2/O2 ATMOSPHERES. B. GAS: SOLID REACTION WITH FORMATION OF VOLATILE SPECIES Ph.D. Thesis

Tai-Kang Liu Mar. 1980 197 p refs

(Contract W-7405-eng-82)

(IS-T-893) Avail: NTIS HC A09/MF A01

The thermogravimetric method was used to study high temperature corrosion under SO2/O2 atmosphere applied to Armco 18SR alloys with different heat treatment histories. Armco T310 and pure chromium between 750 and 1100 C. Armco 18SR-C has the best corrosion resistance of the Armco 18SR alloys. Armco T310 is not protective at high temperatures. The available rate data on the oxidation of chromium oxide, chlorination of chromium, oxidation-chlorination of chromium oxide, chlorination of nickel and chlorination of iron were found to be predictable. The calculation of high temperature volatilization rate was performed using the available fluid correlation equations and the Lennard-Jones parameters derived from the molecule with similar structure and from the low temperature viscosity measurement. The lower predicted volatilization rate is due to the use of the Chapman-Enskog equation with the Lennard-Jones parameters mostly derived from the low temperature viscosity measurement. DOE

N80-25431# AD-EX, Portola Valley, Calif.

ELECTROCHEMICAL PROPERTIES OF CERTAIN NEW TERNARY AND QUATERNARY ALLOYS BASED ON ALUMINUM

B. Jovanovic, S. Zecevic, D. M. Drazic, and A. R. Despic Nov. 1979 12 p Transl. into ENGLISH of paper presented at 20th Conf. of Serbian Chemists, Belgrade, 18 Jan. 1977 Sponsored by DOE Prepared for California Univ., Lawrence Livermore Lab. (UCRL-Trans-11535) Avail: NTIS HC A03/MF A01

The effect of adding small amounts of various elements to aluminum on its electrochemical behavior was studied. It was demonstrated that 0.1 percent In, Ga, and Tl significantly changes three properties of aluminum and this otherwise electrochemically inactive metal is thus converted into a metal that can be used as a highly active anode in galvanic elements or in anticorrosion protection. These three properties are: the stationary potential (which for pure aluminum in a chloride solution amounts to only -0.56 V vs a normal hydrogen electrode, while with alloying it becomes more negative by several hundred millivolts); corrosion in an open circuit (which must be limited so that considerable self-discharge, i.e., unproductive consumption of the metal, does not occur); and corrosion of the metal during anode dissolution, which manifests itself by evolution of gaseous hydrogen and can be increased or decreased by increasing the anode current density and which is referred to in the electrochemical literature as a negative or positive differential effect. It was demonstrated that the introduction of additives reduces the negative differential effect (e.g., from 14 percent for pure aluminum to 0.5 percent for the alloy Al-In) and increases anodic utilization of aluminum correspondingly (from 86 percent to 99.5 percent). Two ternary combinations (Al-In-Tl) and Al-In-Ga) and a quaternary alloy with all three alloying elements (Al-In-Ga-Tl) were studied. DOE

N80-25432# California Univ., Livermore. Lawrence Livermore Lab.

MATHEMATICAL MODEL FOR SIMULATION OF THE FATE OF COPPER IN A MARINE ENVIRONMENT

G. T. Orlob, Davorin Hrovat, Thomas Wakeman, and Florence L. Harrison 27 Sep. 1979 62 p refs Prepared in cooperation with California Univ., Davis Prepared for Nuclear Regulatory Commission, Washington, D.C.

(Contract W-7405-eng-48)

(NUREG-CR-1088; UCRL-52728) Avail: NTIS HC A04/MF A01

A mathematical model for the simulation of the fate of copper in a marine environment was developed. The model, which describes the kinetics of copper transformation from ionic copper to complexes with dissolved organic matter and sorption on suspended sediment, is imbedded in a two dimensional finite element model which is capable of simulating advection and diffusion processes in natural receiving waters. Kinetic rate and equilibrium constants for the model were developed independently in laboratory experiments. A test simulation was performed under realistic conditions of slug discharge of ionic copper with the cooling water from a nuclear power station situated on the California coast. Results show that the model performed correctly under the conditions assumed. Future research and development is directed toward improving description of copper kinetics under varying environmental conditions and exploring the sensitivity of the model. DOE

N80-25433# Connecticut Univ., Storrs. Inst. of Materials Science.

ELECTRODE POLARIZATION STUDIES IN HOT CORROSION SYSTEMS Progress Report, 1 Jun. 1979 - 31 Apr. 1980

Owen F. Devereux Feb. 1980 39 p refs

(Contract EY-76-S-02-2960)

(COO-2960-4) Avail: NTIS HC A03/MF A01

A comprehensive set of tests were performed on iron, nickel, and types 304 and 316 stainless steel in gas mixtures of controlled CO, CO sub 2, H sub 2 and H sub 2S at a total pressure of one atmosphere and in a temperature range of 900 - 1000. The polarization curves thus derived were reduced to a set of empirical kinetic constants via computer modelling. Oxidation of iron in gas mixtures of controlled CO, CO2, H2, and H sub 2S at a total pressure of one atmosphere and a temperature of 900 C has been studied. In the S sub 2 and O sub 2 ranges employed sulfide scales were formed; O sub 2 influenced the short term sulfidation kinetics. Specimen geometry was seen as a significant factor influencing long term kinetics. A reproducible corrosive attack was seen at the metal/molten carbonate/gas phase junction. This attack was quantitatively evaluated and explained in terms of a diffusion model. Previous modelling procedures were expanded to include one or more anodic reactions displaying passive behavior. DOE

N80-25434# National Technical Information Service, Springfield, Va.

TUNGSTEN AND TUNGSTEN ALLOY POWDER METALLURGY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Feb. 1980

William E. Reed Mar. 1980 134 p Supersedes NTIS/PS-79/0222; NTIS/PS-78/0163

(PB80-806011; NTIS/PS-79/0222; NTIS/PS-78/0163) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Federally-funded studies on fabricating and processing of tungsten, its alloys and composites are cited. Methods described include compacting, pressing, sintering, extruding, and rolling. Infiltration of porous tungsten shapes is also covered. The mechanical properties, thermal properties, and microstructure of these products are reported. Some products studied are rocket nozzles, nuclear reactor materials, and porous ionizers. This updated bibliography contains 127 abstracts, 5 of which are new entries to the previous edition. GRA

N80-25435# National Technical Information Service, Springfield, Va.

TUNGSTEN AND TUNGSTEN ALLOY POWDER METALLURGY. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Feb. 1980

William E. Reed Mar. 1980 255 p Supersedes NTIS/PS-79/0223; NTIS/PS-78/0164

(PB80-806029; NTIS/PS-79/0223; NTIS/PS-78/0164) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Worldwide journal articles are citied on tungsten powder preparation and processing. Studies include sintering, densification, shrinkage, phase analysis, and heat treatment. The physical and mechanical properties of tungsten powder metal products

are included. The effects of additives and particle size on the sintering and sintered articles are also described. This updated bibliography contains 248 abstract, 31 of which are new entries to the previous editon. GRA

N80-25436# National Technical Information Service, Springfield, Va.
SUPERALLOYS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Feb. 1980
William E. Reed Mar. 1980 127 p Supersedes NTIS/PS-79/0220: NTIS/PS-78/0199: NTIS/PS-77/0160
(PB80-805831: NTIS/PS-79/0220: NTIS/PS-78/0199: NTIS/PS-77/0160) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Federally funded research on cobalt and nickel based superalloys is cited. Casting and powder metallurgy of these alloys are covered. Properties such as heat resistance, corrosion resistance, microstructure, fracture, and creep are described. The use of these materials in nuclear reactors, gas turbine parts, and high temperature equipment is a major part of this compilation. This updated bibliography contains 120 abstracts, 45 of which are new entries to the previous edition. GRA

N80-25437# National Technical Information Service, Springfield, Va.
SUPERALLOYS, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Mar. 1977 - 1978
William E. Reed Mar. 1980 272 p
(PB80-805849) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Worldwide research is cited on cobalt, iron, and nickel based superalloys. The manufacture, melting, casting, powder metallurgy, forging and welding of these alloys are covered. Studies on corrosion, high and low temperature properties, physical, and mechanical properties of these materials are included. Applications discussed are nuclear reactors, gas turbines, superconducting machinery, and heat exchangers. This updated bibliography contains 255 abstracts, none of which are new entries to the previous edition.

N80-25438# National Technical Information Service, Springfield, Va.
SUPERALLOYS, VOLUME 4. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1979 - Feb. 1980
William E. Reed Mar. 1980 139 p Supersedes NTIS/PS-79/0221: NTIS/PS-78/0201: NTIS/PS-77/0161
(PB80-805856: NTIS/PS-79/0221: NTIS/PS-78/0201: NTIS/PS-77/0161) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Worldwide research is cited on cobalt, iron, and nickel based superalloys. The manufacture, melting, casting, powder metallurgy, forging, and welding of these alloys are covered. Studies on corrosion, high and low temperature properties, physical, and mechanical properties of these materials are included. Applications discussed include nuclear reactors, gas turbines, superconducting machinery, and heat exchangers. This updated bibliography contains 132 abstracts, 126 of which are new entries to the previous edition. GRA

N80-25439# National Technical Information Service, Springfield, Va.
HYDROGEN EMBRITTLEMENT OF METALS. CITATIONS FROM THE AMERICAN PETROLEUM INSTITUTE DATA BASE Progress Report, 1971 - 1979
William E. Reed Mar. 1980 212 p Supersedes NTIS/PS-79/0180
(PB80-805963: NTIS/PS-79/0180) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Research reports on hydrogen embrittlement of ferrous and nonferrous metals are cited. Studies relating to mechanical properties, corrosion, failure, testing, and inhibition are presented. Hydrogen embrittlement is described in pressure vessels, pipes, welds, and steels. Reports on materials used in pipeline, refinery, petrochemical and energy storage service are included. This updated bibliography contains 205 abstracts, 25 of which are new entries to the previous edition. GRA

N80-25440# National Technical Information Service, Springfield, Va.
HYDROGEN EMBRITTLEMENT OF METALS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1975 - Feb. 1980
William E. Reed Mar. 1980 260 p Supersedes NTIS/PS-79/0177: NTIS/PS-78/0096 and NTIS/PS-77/0004
(PB80-805948: NTIS/PS-79/0177: NTIS/PS-78/0096: NTIS/PS-77/0004) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Studies on hydrogen embrittlement relating to mechanical properties, irradiation, crystal structure, and corrosion are cited. This compilation also covers testing, hydrogen analysis and diffusion, welding, electroplating, fabrication, and processing with respect to the ductile brittle transition in metals. Reports on nuclear reactor materials, hydrogen storage equipment, and energy related systems are included. This updated bibliography contains 253 abstracts, 45 of which are new entries to the previous edition. GRA

N80-25441# National Technical Information Service, Springfield, Va.
HYDROGEN EMBRITTLEMENT OF METALS, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - Feb. 1980
William E. Reed Mar. 1980 260 p Supercedes NTIS/PS-79/0179: NTIS/PS-78/0097 and NTIS/PS-77/0006
(PB80-805955: NTIS/PS-79/0179: NTIS/PS-78/0097: NTIS/PS-77/0006) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Research from worldwide journal literature on hydrogen embrittlement of ferrous and nonferrous metals is cited in this bibliography. Studies on mechanical properties, heat treatment, crystal structure, fracture, hydrogen diffusion, grain growth, strain, pressure, and testing in relation to embrittlement are covered. This phenomena is described in pressure vessels, pipes, welds, engineering equipment, and electroplates. This updated bibliography contains 253 abstracts, 119 of which are new entries to the previous edition. GRA

N80-25442# National Technical Information Service, Springfield, Va.
CORROSION OF STAINLESS STEEL, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Feb. 1980
William E. Reed Mar. 1980 190 p Supersedes NTIS/PS-79/0208: NTIS/PS-78/0233 and NTIS/PS-77/0183
(PB80-805906: NTIS/PS-79/0208: NTIS/PS-78/0233: NTIS/PS-77/0183) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Federally funded research on stainless steel composition, mechanical properties, structure, and testing in relation to corrosion is cited. The majority of research concerns nuclear reactor materials. In addition, corrosion studies in coal gasification plants, rocket propellant tanks, underwater cables, batteries, and geothermal systems are included. This updated bibliography contains 183 abstracts, 54 of which are new entries to the previous edition. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N80-25443 Massachusetts Inst. of Tech., Cambridge.
CONSTITUTIVE EQUATIONS FOR POLYMERS UNDERGOING CHANGES IN MICROSTRUCTURE WITH DEFORMATION Ph.D. Thesis
Rosanna Falabella 1980 228 p
Avail: Univ. Microfilms Order No. 8012601

Constitutive equations for stress for solid polymers such as segmented polyurethane elastomers that undergo microstructural change with deformation are developed. Viscoelastic constitutive relations based on the fading memory assumption are shown to be inappropriate for materials that suffer a microstructural

weakening that depends on maximums in the strain history, regardless of when in the history the maximum occur. For the specific case of polyurethanes, a constitutive equation for stress is developed by defining the stress fuctional in terms of the history of the strain and the history of the orientation function of the hard chain segments of the polymers. The orientation functions of the hard and soft chain segments of the polyurethane, as determined by infrared dichroism, are shown to be simply related to each other and the tensile strain by assuming that the hard and soft chain segments act in series under load.
Dissert. Abstr.

N80-25444 Massachusetts Inst. of Tech., Cambridge.
***INTERFACIAL TENSION THEORY FOR LOW MOLECULAR WEIGHT AND POLYMER SYSTEMS* Ph.D. Thesis**
Claudia Ingrid Poser 1980 210 p
Avail: Univ. Microfilms Order No. 8012636

The development of an interfacial tension theory applicable to low molecular weight fluids and polymer systems is reported. The theoretical treatment includes a rederivation of the free energy minimization formalism for inhomogeneous systems in the gradient approximation. The gradient approach is then combined with a slightly modified version of the lattice fluid model. The resulting theory describes liquid-vapor and liquid-liquid interfaces of pure and mixed nonpolar and slightly polar systems away from the critical region. The interfacial equations are amenable to numerical evaluation, and the theoretical predictions were tested against experiment for the cases of pure components and binary mixtures. For binary mixtures, the theory contains an additional parameter corresponding to the intermolecular interactions between unlike molecules. For nonpolar liquid mixtures, the theory can predict the composition dependence of the liquid-vapor interfacial tension to within 5%. Positive deviations from ideal tension behavior as well as strong preferential adsorption at the interface are correctly predicted. Dissert. Abstr.

N80-25445 Case Western Reserve Univ., Cleveland, Ohio.
MICROSTRUCTURES OF STRUCTURAL CERAMICS *Ph.D. Thesis*
Linus Uzodimma Joseph Ogbuji 1979 142 p
Avail: Univ. Microfilms Order No. 8013654

Evidence is presented to show that dislocations are generated during the sintering of 0.4 micrometer Al2O3 powder, as a result of interparticle neck curvature stresses. The polymorphic phase transformation in sintered and hot pressed SiC is investigated. The /111/ coherent twins in the Beta envelope of a composite (alpha core/Beta envelope) grain are shown to play a centeral role in the transformation mechanism, their boundaries serving as preferred nucleation sites for the alpha phase. Various structural phenomena in SiC, such as profuse faulting in a single polytype, microsyntactic coalescence of different polytypes, and long period polytypism, are also examined and accounted for in the light of the proposed transformation mechanism.
Dissert. Abstr.

N80-25446 Case Western Reserve Univ., Cleveland, Ohio.
CRYSTALLIZATION OF ULTRA-QUENCHED POLYMER GLASSES *Ph.D. Thesis*
Charles Franklyn Pratt 1980 179 p
Avail: Univ. Microfilms Order No. 8013858

An ultraquenching technique was used to prepare thin (ca. 1000 angstroms) amorphous films of polyethylene, polypivalolactone, and poly(4-methylpentene-1). These films were characterized by electron microscopy, electron diffraction, and dynamic mechanical analysis. Other ultraquenched films of these polymers were crystallized by annealing for various times in the vicinity of their glass transition temperatures. Electron microscopy and electron diffraction were used to follow the reorganization of the thin films. Morphological and dynamic mechanical data confirm earlier findings of a double Tg for linear polyethylene. For ultraquenched films, a lower Tg(L) = 195 K was measured as the temperature at which crystallization of the amorphous polymer could first take place. Crystallization at Tg(L) appeared to proceed by the aggregation of the originally present nodules to form lamellar platelets, implying that some sort of chain folding was involved. Dissert. Abstr.

N80-25447 Detroit Univ., Mich.
PHENOMENOLOGICAL STUDY ON REINFORCEMENT OF ELASTOMERS *Ph.D. Thesis*
Srimannarayana Kakarala 1980 170 p
Avail: Univ. Microfilms Order No. 8013892

The polymer-filler bonding of various filled rubbers was examined to study the influence of polymers and carbon blacks on reinforcement properties of elastomers. A central composite design with four independent variables, polymer Tg, carbon black surface, area structure, and amount was used in planning the experiments. In the unvulcanized state, the amount of insoluble rubber (bound rubber) and its effect on extrusion characteristics and glass transition temperature of the bonded polymer were measured. The filled rubber vulcanizate properties such as the dynamic moduli and loss tangent, equilibrium modulus, and solvent swell were compared to indicate the extent of the filler reinforcement. Response surface models were derived for the above filled rubber properties as a function of the four independent variables. The dynamic properties of the filled vulcanizates are strain dependent. The loss tangent was found to be a structure independent function of the total interfacial area of carbon blacks and seemed to depend on the continuity of the black network dispersed in the polymer matrix. The occluded rubber had a very significant effect on restricting the solvent swell and enhancing the equilibrium modulus. Dissert. Abstr.

N80-25448# Honeywell Systems and Research Center, Minneapolis, Minn. Systems and Research Center.
SELECTIVE PAINT DEVELOPMENT *Progress Report, 5 Dec. 1978 - 31 Jul. 1979*
W. D. McKelvey, P. B. Zimmer, and R. J. H. Lin Aug. 1979 39 p refs
(Contract EM-78-C-04-4287)
(ALO-4287-T2) Avail: NTIS HC A03/MF A01

Eighteen hundred square feet of aluminum foil were coated with thickness-sensitive selective paint. The feasibility of a high speed, large-scale roller coating technique was demonstrated. Coating thermal stability, weathering and humidity resistance, and effects of pigment particle size on coating optical properties were studied. Thickness-insensitive paint with urethane binder was evaluated. A medium scale (1 kg) of thickness-insensitive paint solution was prepared which achieved an alpha/sub s/ of 0.90 and epsilon of 0.35. DOE

N80-25449# Bendix Corp., Kansas City, Mo.
FAILURE ANALYSIS OF CERAMIC-TO-METAL SEALS
W. G. Gates Mar. 1980 25 p ref
(Contracts EY-76-C-04-0613; DE-AC04-76DP-00613)
(BDX-613-2414) Avail: NTIS HC A02/MF A01

A typical analysis of a failed assembly and a recommended rework process is presented. In addition, steps are proposed to minimize the occurrence of future ceramic-to-metal seal failures. DOE

N80-25450# Mound Lab., Miamisburg, Ohio.
BULK POLYMERIZATION AND STABILITY OF ANAEROBIC ADHESIVES
Ruth B. Whitaker and John V. Dichiaro 25 Feb. 1980 57 p refs
(Contracts EY-76-C-04-0053; DE-AC04-76DP-00053)
(MLM-2647) Avail: NTIS HC A04/MF A01

A search of the literature on anaerobic adhesives from 1974 to 1978 was performed. Many candidate anaerobic adhesive formulations were prepared, and their reaction rates were determined in bulk from room temperature (RT) to 55 C. Formulations based on the monomer, tetraethylene glycol dimethacrylate (TEGDMA), or a 50/50 mixture of ethylene glycol dimethacrylate and TEGDMA yielded the best combination of storage stability combined with ability to polymerize. These systems employed cumene hydroperoxide as initiator, p-benzoquinone as inhibitor, and a latent accelerator. For polymerization at much lower temperatures (-18 to 0 C, systems were developed which employed TEGDMA or polyfunctional acrylate monomers, p-methane hydroperoxide as initiator, and, at 18 C, no inhibitor. The stability of stored anaerobic adhesive formulations and their ability to polymerize following aging were examined. It was found that most formulations of interest remain liquid at 54 C for > 100 days but solidify at 74 C in a much shorter time. DOE

N80-25451# National Technical Information Service, Springfield, Va.
REINFORCED PLASTICS: FIBERGLASS REINFORCEMENT, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE
Progress Report, 1977 - Jan. 1980
Diane M. Cavagnaro Feb. 1980 110 p Supersedes NTIS/PS-79/0095; NTIS/PS-78/0090 and NTIS/PS-77/0068
(PB80-804743; NTIS/PS-79/0095; NTIS/PS-78/0090; NTIS/PS-77/0068) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 11D

Physical properties, bonding, lamination, design, and test methods for fiberglass reinforced plastics are covered. Studies on fabrication and processing of these materials for aircraft, spacecraft, ship hulls, automobiles, and flywheels are included. Plastic matrices include epoxy resins, polyimide resins, polyesters, polyamides, and polyurethanes. This updated bibliography contains 103 abstracts, 25 of which are new entries to the previous edition. GRA

N80-25452# National Technical Information Service, Springfield, Va.
REINFORCED PLASTICS: BORON, CARBON, AND OTHER REINFORCING MATERIALS, VOLUME 3. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1978 - Feb. 1980
Diane M. Cavagnaro Feb. 1980 213 p Supersedes NTIS/PS-79/0097; NTIS/PS-78/0091 and NTIS/PS-77/0070
(PB80-804750; NTIS/PS-79/0097; NTIS/PS-78/0091; NTIS/PS-77/0070) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 11D

Studies on reinforced epoxy polyimide polyester and phenolic matrices are covered. Polymers to reinforced plastics are also described. Citations on fabrication, lamination, mechanical properties, stress analysis, and viscoelasticity are included. Reinforced plastics for aircraft and spacecraft applications are also included. This updated bibliography contains 206 abstracts, 103 of which are new entries to the previous edition. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.*

N80-25453*# United Technologies Corp., East Hartford, Conn.
EXTERNAL FUEL VAPORIZATION STUDY, PHASE 1
E. J. Szetela and L. Chiappetta Jun. 1980 133 p refs
(Contract NAS3-21971)
(NASA-CR-159850; UTRC-R80-914607-12) Avail: NTIS HC A07/MF A01 CSCL 21D

A conceptual design study was conducted to devise and evaluate techniques for the external vaporization of fuel for use in an aircraft gas turbine with characteristics similar to the Energy Efficient Engine (E(3)). Three vaporizer concepts were selected and they were analyzed from the standpoint of fuel thermal stability, integration of the vaporizer system into the aircraft engine, engine and vaporizer dynamic response, startup and altitude restart, engine performance, control requirements, safety, and maintenance. One of the concepts was found to improve the performance of the baseline E(3) engine without seriously compromising engine startup and power change response. Increased maintenance is required because of the need for frequent pyrolytic cleaning of the surfaces in contact with hot fuel. R.C.T.

N80-25454*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL AND EXPERIMENTAL EVALUATIONS OF THE EFFECT OF BROAD PROPERTY FUELS ON COMBUSTORS FOR COMMERCIAL AIRCRAFT GAS TURBINE ENGINES
A. L. Smith Jun. 1980 20 p refs Presented at 16th Joint Propulsion Conf., Hartford, Conn., 30 Jun. - 2 Jul. 1980; sponsored by AIAA, ASME, and SAE
(NASA-TM-81496; E-433) Avail: NTIS HC A02/MF A01 CSCL 21D

The impacts of broad property fuels on the design, performance, durability, emissions, and operational characteristics of current and advanced combustors for commercial aircraft gas turbine engines were studied. The effect of fuel thermal stability on engine and airframe fuel system was evaluated. Tradeoffs between fuel properties, exhaust emissions, and combustor life were also investigated. Results indicate major impacts of broad property fuels on allowable metal temperatures in fuel manifolds and injector support, combustor cyclic durability, and somewhat lesser impacts on starting characteristics, lightoff, emissions, and smoke. E.D.K.

N80-25455# C-E Lummus, Bloomfield, N.J.
SYNTHANE PILOT PLANT, SOUTH PARK TOWNSHIP, PENNSYLVANIA Final Report
1979 548 p refs
(Contract EY-76-C-02-0003)
(COO-0003-41-T1) Avail: NTIS HC A23/MF A01

The Synthane pilot plant was operated during the period 1975-1978 to test the feasibility of the Synthane process to produce pipeline quality gas from coal. The operations of the Synthane pilot plant were suspended in September, 1978. The unit was mothballed and is presently being maintained in a standby mode. Various aspects of this project are summarized. The operation, technical evaluation, and engineering for the period 1976-1978 are also included. DOE

N80-25456# New Zealand Energy Research and Development Committee, Auckland.
POTENTIAL OF ENERGY FARMING FOR TRANSPORT FUELS IN NEW ZEALAND
G. S. Harris, M. L. Leamy, T. Fraser, J. B. Dent, W. A. N. Brown, W. B. Earl, T. W. Fookes, and J. Gilbert 1979 135 p refs
(NZERDC-46) Avail: NTIS HC A07/MF A01

Farming for production of fuel in New Zealand is discussed. The technical and economic aspects of energy farming and guidelines for development of this energy source are presented. Costs and energy ratios are given and areas of concern are highlighted. The results of studies on sugar beets, fodder beets, maize, lucerne, and radiata pine are discussed. The production of methanol, methane, and ethanol by fermentation and gasification are described. Environmental issues are also discussed. DOE

N80-25457# New Zealand Energy Research and Development Committee, Auckland.
POTENTIAL OF ENERGY FARMING FOR TRANSPORT FUELS IN NEW ZEALAND, APPENDICES
G. S. Harris, M. L. Leamy, T. Fraser, J. B. Dent, W. A. N. Brown, W. B. Earl, T. W. Fookes, and J. Gilbert 1979 135 p refs
(NZERDC-46-App) Avail: NTIS HC A07/MF A01

Farming for production of fuel in New Zealand is discussed. Subjects studied in this report are: the suitability and distribution of land for the production of biomass, forestry, agricultural crops, maize grain production in the Waikato; processing routes for transport fuels; advisory panel research in the Waikato; scenarios for transport fuels to 2000; toxicity and other potential danger considerations associated with distribution and opportunity costs. DOE

N80-25458# AD-EX, Portola Valley, Calif.
RELATION BETWEEN THE ELECTRONIC STRUCTURE AND THE SHOCK SENSITIVITY OF NITRATED SECONDARY EXPLOSIVES. 3: INFLUENCE OF THE CRYSTAL ENVIRONMENT
A. Delpuech and J. Cherville 1979 21 p refs Transl. into ENGLISH from Propellants and Explosives 4, France, 1979 p 61-65 Sponsored by DOE Prepared for California Univ., Lawrence Livermore Lab.
(UCRL-Trans-11510) Avail: NTIS HC A02/MF A01

The influence of crystal interactions on the molecular parameters correlated with the shock sensitivity is described. The results obtained permit more precise statement of the roles of the molecule and of the crystal respectively at the time of initiation of the detonation. They show that in this area, the conclusions drawn from calculations on an isolated molecule in its crystalline conformation are valid for the whole crystal. DOE

N80-25458# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
CRITICAL STUDIES OF THE RAPID PYROLYSIS AND HYDROPYROLYSIS OF COAL Quarterly Progress Report, 10 Feb. - 30 Jun. 1979
Jack B. Howard, Patrick C. Bigot, Ted W. Bush, Richard Carbon, Raymond Cassaprima, Howard Franklin, Michael A. Serio, Robert M. Steinberg, Mark Zacharias, and William A. Peters 1979 5 p Sponsored in part by Mobile Research Foundation
(Contract EX-76-A-01-2295)
(FE-MIT-2295T26-9) Avail: NTIS HC A02/MF A01

Coal samples pretreated with minerals were prepared. Samples of demineralized coal were impregnated with CaO from solution, or co-slurried with suspensions of quartz, pyrite, kaolinite, shale, montmorillonite, or acid-treated montmorillonite. Runs were performed on demineralized bituminous coals under 1000 psi H2. Pyrolysis of the calcite and CaO pretreated samples was carried out at 1 atm. He under the test conditions of 700 C zero holding time, and 1000 C, 5 second holding time. Tar production was suppressed, light gas yield and ethylene/ethane ratio increased slightly, and there was a multifold increase in production of carbon oxides, CO2 at lower temperatures, shifting to CO at higher temperature. This effect was more pronounced with the CaCO3 sample than with the CaO sample, the excess carbon oxides in the former case probably originating from calcite decomposition. DOE

N80-25460# Oklahoma State Univ., Stillwater. Dept. of Chemistry.
CONSEQUENCES OF THE MASS SPECTROMETRIC AND INFRARED ANALYSIS OF OILS AND ASPHALTENES FOR THE CHEMISTRY OF COAL LIQUEFACTION. CHARACTERIZATION OF COAL-DERIVED LIQUIDS AND OTHER FOSSIL FUEL RELATED MATERIALS EMPLOYING MASS SPECTROMETRY
P. A. Benson, S. E. Schoppelle, G. J. Greenwood, T. Aczel, Q. G. Grindstaff, and B. F. Beier Sep. 1979 120 p refs Prepared in cooperation with Exxon Research and Engineering Co., Baytown, Tex.
(Contract EX-76-S-01-2537)
(FE-2537-10) Avail: NTIS HC A06/MF A01

A. COED liquid was separated into oils, asphaltenes, and residue. Anion and cation exchange chromatography fractionated the oils and asphaltenes into acids, bases, and neutrals; silica gel chromatography separated neutral fractions into saturate and aromatic concentrates. Infrared spectra of the aromatic concentrates identified functional groups. Carbon number distributions for the aromatic concentrates were obtained using high and low resolution FI/MS and high resolution 70-eV EI/MS and ultra high resolution low-voltage EI/MS. The asphaltenes contain higher molecular weight Z series, higher molecular weight homologs and different compound types than do the oils. Results show that simple solvent extraction produces compositionally nonunique fractions. Thus, detailed molecular analysis is a prerequisite for the correct assessment of: (1) reaction conditions and catalyst on the mechanism and kinetics of coal liquefaction; and (2) alteration in process conditions on the quality of the coal liquid. DOE

N80-25461# West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
OPTIMIZATION STUDIES OF VARIOUS COAL-CONVERSIONS SYSTEMS: COAL DISSOLUTION PHENOMENA Interim Report, Apr. - Dec. 1978
C. Y. Wen and K. W. Han 1978 199 p refs
(Contract EX-76-C-01-2274)
(FE-2274-7) Avail: NTIS HC A09/MF A01

The bituminous coal dissolution was investigated in order to develop information which would be useful in the design and scale up considerations for a commercial liquefaction plant. The experiment data were derived from pilot plants using various coal liquefaction processes. The data were analyzed in order to better understand the phenomena which occur in the preheater and reactor sections during the liquefaction of coal. Two different stages were found to exist in the coal dissolution reactions. In the initial stage of coal dissolution, a first order reaction scheme was proposed, whereby coal undergoes a fast thermal reaction producing preasphaltene as the predominant product. In the second stage of coal dissolution, a slower first order rate expression was proposed in which the preasphaltene was converted to benzene solubles with subsequent rehydrogenation of the coal derived solvent. DOE

N80-25462# Dynatech R/D Co., Cambridge, Mass.
LIQUID FUELS PRODUCTION FROM BIOMASS, NO. 7 Progress Report, 1 Jan. - 31 Mar. 1979
J. E. Sanderson, D. V. Garcia-Martinez, G. S. George, J. J. Dillon, and D. L. Wise 1979 86 p refs
(Contract EG-77-C-02-4388)
(COO-4388-7) Avail: NTIS HC A05/MF A01

The process of converting biomass into liquid hydrocarbon fuels is discussed with reference to another process which ferments marine algae to acedic acid. The conditions under which substrates other than marine algae may be converted in good yield to organic acids are also reported. Results indicate that the electrolysis of organic acids produced by fermentation to liquid hydrocarbon fuels operates with a favorable energy balance of 6/1 based on the applied potential and over 10/1 based on the working potential. DOE

N80-25463# Adelphi Univ., Garden City, N. Y.
FEASIBILITY STUDY OF USING A COAL/WATER OIL EMULSION AS A CLEAN LIQUID FUEL Final Report
Feb. 1980 43 p
(Contract EX-76-S-01-2437)
(FE-2437-T1-Add) Avail: NTIS HC A03/MF A01

The combustion, rheology, and settling of various concentrations of No. 6 oil emulsions and slurries were compared with various average particle sizes of coal. The No. 6 oil and a slurry of 40 percent coal, 60 percent oil with an average coal particle size anti x = 56.6 microns were burned. Pendulum and viscosity data is presented on four different concentrations of coal, oil and water with four different particle size distributions. Infrared radiation tests were performed on No. 6 oil and a coal/No. 6 oil slurry, and for a comparison on No. 4 oil and a coal/No. 4 oil emulsion. DOE

N80-25464# Scientific Design Co., Inc., New York.
EVALUATION OF THE TEXACO SYNTHESIS GAS GENERATION PROCESS FOR THE PRODUCTION OF HYDROGEN FROM SRC-2 RESIDUE
T. Y. Chang and Allan S. West Dec. 1979 87 p
(Contract W-7405-eng-26)
(ORNL/Sub-7240/6) Avail: NTIS HC A05/MF A01

The results are presented of an evaluation of the Texaco Synthesis Gas Generation Process for the production of hydrogen from SRC-II vacuum bottoms residue. Preliminary process designs for a gasification facility for a commercial scale coal liquefaction plant were prepared. A number of studies were performed to establish a near-optimal operating pressure and method of acid gas removal. Plant investment and operating cost estimates are included. It is concluded that the gasifier is well suited for the efficient production of hydrogen from SRC-II residue and only minimal developmental work is needed prior to commercializations. Because of the short duration of the test runs, refractory and burner lives are a point of concern. Based on the current state of oxygen compression technology the gasifier should be designed to operate at about 800 psig. DOE

N80-25465# Battelle Pacific Northwest Labs., Richland, Wash.
THERMOCHEMICAL CONVERSION OF BIOMASS: AN OVERVIEW OF R AND D ACTIVITIES SPONSORED BY THE BIOMASS ENERGY SYSTEMS BRANCH OF DOE
G. F. Schiefelbein, L. J. Sealock, Jr., and S. Ergun Oct. 1979 18 p Prepared in cooperation with California Univ., Lawrence Berkeley Lab.
(Contract EY-76-C-06-1830)
(PNL-SA-8266) Avail: NTIS HC A02/MF A01

The mission is to develop competitive processes for the conversion of renewable biomass resources into clean fuels and chemical feedstocks which can supplement those produced from conventional sources were developed. A description of thermochemical conversion program areas and an overview of specific thermochemical conversion projects are presented. DOE

N80-25466# Garrett Energy Research and Engineering, Inc., Claremont, Calif.
CONVERSION OF BIOMASS MATERIALS INTO GASEOUS PRODUCTS. OPERATION OF THE PDU Final Report
Donald E. Garrett and Ritchie D. Mikesell Sep. 1979 431 p refs
(Contract EY-76-C-03-1241)
(SAN-1241-3) Avail: NTIS HC A19/MF A01

Initial work on a two foot diameter, single hearth reactor provided comprehensive design data through an examination of the pertinent variable over a fairly wide range of operations. Kinetic and dynamic models were obtained for each of the reaction stages that would occur within a multiple hearth reactor. This data led to the design and construction of a process development unit (PDU) which consisted of four, four foot diameter hearths capable of processing six wet tons (50% moisture), or three dry tons of biomass per day through the steps of preheating, drying, pyrolysis, combustion, and gasification. Operation of the PDU included 10 to 20 runs on each of these steps, and work was completed with a five day, 24 hour per day, continuous operation. Process design, capital and operating costs, and an economic analysis based on this data indicated that no cost, moisture manure could produce about a 300 Btu gas with a breakeven price of $4 per million Btu's in a 100 dry ton per day unit and $2.40 per million Btu's in a 300 tons per day unit. DOE

N80-25467# Los Alamos Scientific Lab., N. Mex.
LIQUID HYDROGEN-FUELED VEHICLE PROJECT
Walter F. Stewart 1979 16 p refs Presented at the Automotive Technol. Develop. Contractor's Coord. Meeting, Dearborn, Mich., 23-25 Oct. 1979
(Contract W-7405-eng-36)
(LA-UR-79-2883; CONF-791082-1) Avail: NTIS HC A02/MF A01

A cooperative evaluation and state-of-the-art demonstration project for liquid hydrogen vehicle onboard storage and refueling techniques is discussed. Safety, economic, and energy assessments for liquid hydrogen as a fuel are also include. A baseline system is provided representing present capabilities in engine conversion, liquid hydrogen storage, and liquid hydrogen refueling. DOE

N80-25468# Brookhaven National Lab., Upton, N. Y. Process Sciences Div.
FLASH HYDROPYROLYSIS OF COAL Quarterly Report, 1 Jan. - 31 Mar. 1979
Meyer Steinberg and Peter Fallon Jun. 1979 104 p refs
(Contract EY-76-C-02-0016)
(BNL-51052; QR-8) Avail: NTIS HC A06/MF A01

Process chemistry and design information were obtained on the flash hydropyrolysis process. The design, construction, and operation of a 1 lb/hr downflow entrained tubular reactor system were included. The effect of process variables such as temperature, pressure, feed rates, residence time, coal type and feed gas composition were studied. R.C.T.

N80-25469# California Univ., Livermore. Lawrence Livermore Lab.
STATISTICAL TREATMENT OF HETEROGENEOUS CHEMICAL REACTION IN SHOCK-INITIATED EXPLOSIVES
Stephen G. Cochran 20 Feb. 1980 23 p refs
(Contract W-7405-eng-48)
(UCID-18548) Avail: NTIS HC A02/MF A01

A statistical treatment is introduced for heterogeneities that influence the shock initiation of explosives. Size distribution for hot spots and for local reactions sites are defined along with equations that evolve the distribution in time. The model of heterogeneous reaction along with a homogeneous reaction is solved numerically in a one dimensional hydrodynamic computer program. The model and some results is presented. DOE

N80-25470# Texas A&M Univ., College Station.
CATALYTIC CONVERSION OF METHANOL TO LOW MOLECULAR WEIGHT HYDROCARBONS Ph.D. Thesis
Balaji Bondili Singh Dec. 1979 212 p refs
(Contract EW-78-S-02-4717)
(COO-4717-T1) Avail: NTIS HC A10/MF A01

Methanol is converted to ethylene, propylene, and propane with carbon yields of 70 to 90% at reaction temperatures of 633 to 723 K and pressures from 1 to 18 atmospheres. No permanent deactivation was observed even though the catalyst was overheated once, and were deactivated and regenerated as many as 21 times. The ammonium exchange coupled with the water at high temperature suggest the formation of an ultrastable zeolite. Ethylene yields increase as the temperature increases from 633 to 723 K. DOE

N80-25471# Lummus Co., Bloomfield, N. J.
DEVELOPMENTAL RESEARCH PROGRAM FOR CLEAN INDUSTRIAL AND TRANSPORTATION FUELS FROM COAL: MILESTONE REPORT ON COMPARISON OF CATALYSTS, MARCH 1979
H. D. Schindler and R. H. Long Jul. 1979 36 p refs
(Contract EX-76-C-01-2514)
(FE-2514-M4) Avail: NTIS HC A03/MF A01

Employing a reference cobalt-molybdate 1/16 in extrudate catalyst, a short series of operations were conducted to obtain activity and performance data for comparison with the nickel-molybdenum catalyst previously utilized. Two sets of conditions were investigated as follows: temperatures - 830 and 850 F, pressures - 2100 and 2700 psig, coal space rates - 1.6 and 2.5 lbs coal/hr/lb catalyst, volumetric liquid recycle/fresh feed ratios - 1.5 and 0.8, and coal content of paste - 30 and 35 weight percent. Catalyst ages for the two sets of conditions were 170.4 and 275 lbs coal per lb of catalyst, respectively. The yields and product quality comparisons of the two catalysts at equivalent catalyst ages indicated very little difference in performance. DOE

N80-25472# Institute of Gas Technology, Chicago, Ill.
PREPARATION OF A COAL CONVERSION SYSTEMS TECHNICAL DATA BOOK Quarterly Report, 1 Nov. 1978 - 31 Jan. 1979
Nov. 1979 175 p refs
(Contract EX-76-C-01-2286)
(FE-2286-44) Avail: NTIS HC A08/MF A01

The results of calculations of ammonia and hydrogen sulfide partial pressures in NH3-H2S-H2O subsystem are composed. Results from application of a calorific value formula to chars are also presented. Enthalpies of distillate fractions of various syncrudes are reported along with the comparison of the experimental data with correlations developed for estimating the enthalpies of petroleum fractions. Combustion characteristics of SRC-I liquid are also described. Fixed bed gasification of coal is reviewed. For coal pyrolysis results of investigations of relations between tar-plus-light oil yield in Fischer Assay and various coal rank parameters are described. Carbon deposition boundaries are shown for temperatures between 600 F and 2400 F and pressures ranging between 15 psia and 1000 psia. Two types of carbon were considered graphite and non ideal. DOE

N80-25473# Gulf Research and Development Co., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT OF AN ADVANCED PROCESS FOR CONVERSION OF COAL TO SYNTHETIC GASOLINE AND OTHER DISTILLATE MOTOR FUELS Quarterly Report, Jun. - Aug. 1979
D. C. Succop and F. E. Wynne Dec. 1979 22 p refs
(Contract EX-76-C-01-1800)
(FE-1800-42) Avail: NTIS HC A02/MF A01

Coal slurry heating for hydroliquefaction process is described. Results are reported for Taitel/Dukler predicted flow regimes. DOE

N80-25474# Exxon Research and Engineering Co., Florham Park, N.J.
EDS COAL LIQUEFACTION PROCESS DEVELOPMENT. PHASE 4 Interim Report
Sep. 1979 92 p ref Sponsored in part by Carter Oil Co., Elec. Power Res. Inst., Japan Coal Liquefaction Develop. Co., Phillips Petrol. Co., and Atlantic Richfield Co.
(Contract EF-77-A-01-2893)
(FE-2893-33) Avail: NTIS HC A05/MF A01

A maximum liquids case which utilizes steam reforming of methane, ethane, and propane for hydrogen generation is described. The FLEXICOKING of vacuum bottoms is utilized to

generate low Btu gas fuel for the plant. Main plant fuel utilized as onsite fuel and fuel to the offsite boilers is low Btu gas (LBG). A vaporized C3 LPG backup fuel system is provided in the steam reforming furnaces. Besides LBG, Illinois no. 6 coal can be used in the offsite boilers to generate steam. The short term onsite fuel system variability is accommodated by varying the coal firing rate in the offsite boilers. Longer term variability in onsite fuel demand is accommodated by varying the operations in FLEXICOKING. The plant utilizes LBG for pilots to protect against flameout in all onsite process furnaces, except steam reforming. Pilots are not needed in steam reformers because of the multiplicity of burners. Use of LBG for pilot gas avoids the consumption of high value LPG. DOE

N80-25475# Exxon Research and Engineering Co., Florham Park, N.J.
EDS COAL LIQUEFACTION PROCESS DEVELOPMENT, PHASE 4. EDS COMMERCIAL PLANT STUDY DESIGN UPDATE, OFFSITE DESIGN BASIS: ILLINOIS COAL MARKET FLEXIBILITY SENSITIVITY CASE Interim Report
Jul. 1979 66 p Sponsored in part by Carter Oil Co., Elec. Power Res. Inst., Japan Coal Liquefaction Develop. Co., Phillips Petrol. Co., and Atlantic Richfield Co.
(Contract EF-77-A-01-2893)
(FE-2893-37) Avail: NTIS HC A04/MF A01

The offsite design basis for the EDS commercial plant study design update Illinois coal market flexibility sensitivity case is presented. The use of partial oxidation to produce H2 and sell the C2 gas which was processed by steam reforming was evaluated. DOE

N80-25476# Bituminous Coal Research, Inc., Monroeville, Pa.
TEST AND EVALUATE THE TRI-GAS LOW BTU COAL GASIFICATION PROCESS Quarterly Report, Oct. - Dec. 1979
Jan. 1980 20 p refs
(Contracts ET-78-C-01-2798)
(FE-2798-74) Avail: NTIS HC A02/MF A01

Three tests were conducted in the TRI-GAS PEDU, each in the process design mode. Smooth transfer of both char and gas between reactors was accomplished. Several minor equipment problems were encountered which were alleviated through modifications. DOE

N80-25477# Argonne National Lab., Ill.
ENVIRONMENTAL CONTROL TECHNOLOGY FOR BIOMASS FLASH PYROLYSIS
J. B. L. Harkness, R. D. Doctor (Science Applications, Inc.), and W. H. Seward (Mittelhauser Corp.) 1980 32 p refs Presented at the Energy from Biomass and Wastes Conf., Orlando, Fla., 21 Jan. 1980
(Contract W-31-109-eng-38)
(CONF-800129-2) Avail: NTIS HC A03/MF A01

The effluent emission and control technologies for a dual fluid-bed pyrolysis unit is characterized. The system produces a raw products gas that is passed through a catalytic liquefaction system to produce a fuel comparable to no. 2 fuel oil. A program that will survey several biomass systems to standardize the sampling techniques, prioritize standard analyses and develop a data base so that environmental issues later may be addressed before they limit or impede the commercialization of biomass gasification and pyrolysis technologies was conducted. Emissions were related to both the current and anticipated emissions standards to generate material balances and set design parameters for effluent treatment systems. This permits an estimate to be made of the capital and operating costs associated with these technologies. E.J.R.

N80-25478# National Technical Information Service, Springfield, Va.
SYNTHETIC FUELS: METHANE, VOLUME 1. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - 1977
Diane M. Cavagnaro Feb. 1980 212 p
(PB80-805245) Avail: NTIS HC $30.00/MF $30.00 CSCL 21D

Reports from worldwide research are cited covering the production of methane. The citations pertain to the manufacturing processes and equipment process performance, economics, and combustion technology. The production of methane from wastes, especially agricultural wastes, are covered extensively. This updated bibliography contains 205 abstracts, none of which are new entries to the previous edition. GRA

N80-25479# National Technical Information Service, Springfield, Va.
SYNTHETIC FUELS: METHANE, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - Jan. 1980
Diane M. Cavagnaro Feb. 1980 142 p Supersedes NTIS/PS-79/0030; NTIS/PS-78/0054
(PB80-805252; NTIS/PS-79/0030; NTIS/PS-78/0054) Avail: NTIS HC $30.00/MF $30.00 CSCL 21D

The production of methane is discussed in this bibliography of worldwide journal articles. The reports pertain to the manufacturing processes, equipment used, performance, economics, and combustion technology. Many of the studies cover the production of methane from wastes, especially agricultural wastes. This updated bibliography contains 135 abstracts, 76 of which are new entries to the previous edition. GRA

N80-25480# Columbia Univ., New York. Dept. of Biochemistry.
BIOLOGICAL AND SYNTHETIC SYSTEMS FOR PRODUCTION OF HYDROGEN FROM WATER Semiannual Progress Report, 1 Mar. - 31 Aug. 1979
Alvin I. Krasna Aug. 1979 9 p refs
(Grant NSF AER-74-08381)
(PB80-146269; NSF/RA-790221) Avail: NTIS HC A02/MF A01 CSCL 06A

The production of hydrogen from water to organic compounds using light as the source of energy is considered. Two systems are studied the use of intact hydrogenase containing algae; and the use of spinach chloroplasts coupled to hydrogenase or synthetic catalysts. Since both systems produce oxygen by photolysis of water, a major objective is to develop methods for continuous removal of oxygen which will permit sustained production of hydrogen. The photoproduction of hydrogen by intact algae; a coupled system of chloroplasts and hydrogenase; and the development of partial and completely synthetic systems for photoproduction of hydrogen are described. Recent publications describing this research and related studies are cited. GRA

N80-25481# Tennessee Valley Authority, Muscle Shoals, Ala. Emission Control Development Projects.
EVALUATION OF PHYSICAL/CHEMICAL COAL CLEANING AND FLUE GAS DESULFURIZATION Final Report, Jun. 1978 - Oct. 1979
T. W. Tarkington, F. M. Kennedy, and J. G. Patterson Nov. 1979 378 p refs Sponsored by EPA
(PB80-147622; ECDP/B-5; EPA-600/7-79-250) Avail: NTIS HC A17/MF A01 CSCL 13B

The results of evaluations of physical coal cleaning (PCC), chemical coal cleaning (CCC), and coal cleaning combined with flue gas desulfurization (FGD). Process descriptions, cleaning performances, comparative capital investments, and annual revenue requirements are included. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N80-25482 Columbia Univ., New York.
VISCOSITY OF HE3 IN SUPERFLUID AND FERMI LIQUID REGIMES Ph.D. Thesis
Mark Steinback 1979 220 p
Avail: Univ. Microfilms Order No. 8009703

An oscillation type viscometer and cooling system was designed and constructued to measure the viscosity of liquid He(3), at very low temperature and under pressure. The viscosity experiments were performed over the pressure range 10 to 31 1/4 bar in the low temperature Fermi liquid region and the two superfluid phases of He(3). Between the superfluid transi-

tion temperatures (T sub c < or = 2,600 mK) and 7 mK the data fit the theoretical Germi liquid relation etu (P)T(2) = constant (P). The pressure dependence of this constant was obtained. A sudden decrease in the viscosity was observed in the superfluid phases as temperature decreased from the the transition, which changed to a slow decrease in viscosity with decreasing temperature at the lowest temperaturs attained. At pressures which passed through bot B and A phases, an increase in viscosity on going from B to A phase was observed. Dissert. Abstr.

N80-25483# Council for Scientific and Industrial Research, Pretoria (South Africa).
THE TESTING AND APPLICATION OF MACHINABILITY CRITERIA
I. Yellowley and G. Barrow 1979 29 p refs Transl. into ENGLISH from Fertigung (Switzerland), no. 1, 1971 p 21-29 (CSIR-Trans-1457) Avail: NTIS HC A03/MF A01

The criteria for tool breakdown is discussed with respect to the quality of the workpiece. The influence of the cutting speed, feed, and cutting depth on the tool life is considered. Various methods are used for the determination of tool life. R.C.T.

N80-25484# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
A REVIEW OF FABRIC USAGE IN PAVEMENTS CONSTRUCTED ON LOW-STRENGTH SOILS Final Report
Donald M. Ladd Dec. 1979 29 p refs
(Contract FAA-ER-430-015)
(AD-A083076; FAA-RD-79-93) Avail: NTIS HC A03/MF A01 CSCL 13/2

A literature review was conducted to investigate the uses of fabrics in pavements in order to determine their applicability for use in constructing airport pavements on soft soils. Several theories are presented as to how a fabric enhances the performance of a pavement when fabrics are used as a reinforcement or as a separator over soft soils. Several design methods are discussed and results of several field installations are presented. Test methods and construction techniques are also discussed. R.C.T.

N80-25485# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LA RECHERCHE AEROSPATIALE, BIMONTHLY BULLETIN NO. 1979-5
1979 86 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 287-348 Original French report available from ONERA, Paris FF 36
(ESA-TT-613; ONERA-NT-1979-5) Avail: NTIS HC A05/MF A01

Topics include: noise sources, Navier-Stokes equations, unsteady aerothermodynamic modeling, two dimensional unsteady flow, fatigue testing instrumentation, and harmonic excitation of mechanical systems. For individual titles, see N80-25486 through N80-25491.

N80-25486# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NOTES ON VARIOUS NOISE SOURCES c71
Robert Legendre *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 1-9 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 287-292 Original report in FRENCH previously announced as A80-12354 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

The sources of aircraft noise are classified and physical mechanism of such noise are explored. Two basic categories of noise are specified: noise generated by displacement and deformation of solid bodies, and aerodynamic noise generated by fluid turbulence. Particular consideration is given to panel flutter noise, point and multiple sources, boundary layer noise, vortex noise, and jet noise. Author (ESA)

N80-25487# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
RESOLUTION OF NAVIER-STOKES EQUATIONS BY A SPACE-TIME PSEUDO-SPECTRAL METHOD c34
Yves Morchoisne *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 11-31 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 293-306 Original report in FRENCH previously announced as A80-12355 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

The precision of spectral or pseudo-spectral methods is mostly conditioned by the finite difference scheme used for the calculation of time derivatives. A pseudo-spectral method is proposed based on an iterative calculation and an approximate factorization of the given equations. This method is used for the numerical resolution of the Burgers equation and then the calculation of two dimensional flows of incompressible fluids (Navier-Stokes equation in terms of the stream function). The results are compared with those obtained by a finite difference method and a finite element method. Author (ESA)

N80-25488# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
UNSTEADY AEROTHERMODYNAMICS MODELING c34
Francis Hirsinger *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 33-54 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 307-323 Original report in FRENCH previously announced as A80-12356 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

A numerical method is developed for the modeling of time dependent aerothermodynamic problems. The approach is based on a formulation, integral for space and differential for time, of balance equations for time variable or time invariant cells of any scale. The physical aspect of the model assures great flexibility of utilization and the introduction of different models. Application examples are presented for one or two phase one dimensional flows (biliquid rocket engines) and two dimensional flows with recirculation zones. Author (ESA)

N80-25489# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
TRANSONIC SMALL PERTURBATION EQUATION APPLIED TO THE SOLUTION OF TWO-DIMENSIONAL UNSTEADY FLOWS c34
Michel Couston, Jean-Jacques Angelini, and Pierre Mulak *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 55-73 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 325-340 Original report in FRENCH previously announced as A80-12357 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

The alternating direction implicit scheme is applied to two dimensional unsteady transonic flows, under conditions of potential flow. Numerical results based on the low frequency assumption are compared to results obtained by the linear double lattice method. Nonlinear results are then compared with experiments and calculations by other methods, and it is shown that the present method can be used to solve complex unsteady aerodynamic problems, including the determination of shock wave motions. Author (ESA)

N80-25490# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CYCLIC PLASTIC DEFORMATION FOLLOWER c39
Georges Baudin *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 75-76 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 341-343 Original report in FRENCH previously announced as A80-12358 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

Electronic test equipment was developed for evaluating the low cycle fatigue life of a one dimensional specimen in the frequency range 0.1 to 100 Hz. Cyclic plastic deformation signals can be recorded conveniently by analog or digital means. A circuit diagram is given, and some sample results are presented on an aluminum alloy specimen. Author (ESA)

N80-25491# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
HARMONIC EXCITATION OF MECHANICAL SYSTEMS AT HIGH FREQUENCIES AND LARGE ACCELERATORS c39
Henri Loiseau *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979 1979-5 (ESA-TT-613) 1979 p 79-84 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 345-348 Original report in FRENCH previously announced as A80-12359 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

A structure may be excited for fatigue tests at high frequencies and amplitudes by a conventional electrodynamic exciter. The structure and the exciter are connected by a mechanical device designed to resonate at the excitation frequency. Author (ESA)

N80-25492# Los Alamos Scientific Lab., N. Mex.
MAGNETIC REFRIGERATION FOR SPACE APPLICATIONS: REPORT ON A DESIGN STUDY
J. A. Barclay and W. A. Steyert Feb. 1980 25 p refs
(Contract W-7405-eng-36)
(LA-8134) Avail: NTIS HC A02/MF A01

Results of a preliminary design study of magnetic refrigerators for space applications are summarized. Three items are discussed: (1) a design for a 5-W, 4 K to 20 K magnetic-wheel refrigerator; (2) a theoretical evaluation of a new device, called a regenerative-magnetic expander, that operates between 3.8 K and 20 K; and (3) an active magnetic regenerator that provides refrigeration at 4 K and expels heat at 200 K. DOE

N80-25493# Ames Lab., Iowa. Dept. of Physics.
FLUX-LINE-CUTTING THRESHOLD IN TYPE-2 SUPERCONDUCTORS M.S. Thesis
Ying-Chuen Spring Yeh Mar. 1980 50 p refs
(Contract W-7405-eng-82)
(IS-T-894) Avail: NTIS HC A03/MF A01

The stability of the vortex array in a slab geometry is analyzed. Numerical calculations of the force exerted on a vortex in a perturbed array exhibit the existence of a threshold for flux-line cutting. For angles exceeding the critical value, the array is driven towards flux-line cutting for small perturbations. The critical angle gradient can be employed to express the threshold for flux-line cutting. DOE

N80-25494# National Bureau of Standards, Boulder, Colo. National Measurement Lab.
NBS TIME AND FREQUENCY DISSEMINATION SERVICES Final Report
Sandra Howe, ed. Sep. 1979 25 p Revised
(PB80-147747; NBS-SP-432) Avail: NTIS HC A02/MF A01 CSCL 14B

Detailed descriptions are given of the time and frequency dissemination services of the National Bureau of Standards. These services include the broadcasts from radio stations WWV, WWVH, WWVB, and WWVL, and new times and frequency calibration services using television. The services available on 1 April 1979 are indicated. A list of other publications available about the Time and Frequency Division is also included. GRA

N80-25495# Research Corp. of New England, Wethersfield, Conn.
ASSESSMENT OF METHODS FOR CONTROL OF FUGITIVE EMISSIONS FROM PAVED ROADS Final Report, Sep. 1978 - Sep. 1979
Edward T. Brookman and Deborah K. Martin Nov. 1979 50 p refs
(Contract EPA-68-02-3115)
(PB80-139330; EPA-600/7-79-239) Avail: NTIS HC A03/MF A01 CSCL 13B

Urban road dust problems that are felt to require further attention and the priorities with which the data should be obtained are discussed. The approaches to be taken to obtain the desired information are also defined. GRA

N80-25496# National Bureau of Standards, Washington, D.C.
ANALYSIS OF TENTATIVE SEISMIC DESIGN PROVISIONS FOR BUILDINGS Final Report
Richard N. Wright, Steven J. Fenves (Carnegie-Mellon Univ.), and Richard N. Wright Jul. 1979 602 p refs
(Grants NSF AEN-76-14898; NSF AEN-76-19033)
(PB80-129182; NBS-TN-1100) Avail: NTIS HC A99/MF A01 CSCL 13M

The results are presented of a through study of the internal logic of the tentative provisions for the development of seismic regulations for buildings developed by the Applied Technology Council. The methods of analyses employed provide objective measures of clarity, completeness, and consistancy and an alternative form in which to examine the technical validity of the provisions. These methods include decision logic tables for examining individual provisions information networks for representing the precedence among provisions and classification of the provisions to study their scope and arrangement. A formal representation of the provisions is presented by the data items, decision tables, networks, and classification systems developed in the study. An index and several alternate arrangements of the provision are also included. Opportunities for improvement of the tentative provisions are identified and discussed, and considerations for their future development and implementation within various national standards are highlighted. GRA

N80-25497# National Technical Information Service, Springfield, Va.
METRICATION IN THE UNITED STATES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Feb. 1980
Guy E. Habercom, Jr. Apr. 1980 199 p Supersedes NTIS/PS-79/0359; NTIS/PS-78/0316
(PB80-806938; NTIS/PS-79/0359; NTIS/PS-78/0316)
Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 14B

Materials are cited on the metric system of measurements and conversion of U.S. measurements to the metric system. The matrication process, industrial and economic impacts, problems involved, the benefits anticipated, and public reactions and relations are discussed. The metric system is discussed, along with its application to various fields. This updated bibliography contains 192 abstracts, 13 of which are new entries to the previous edition. GRA

N80-25498# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
TECHNICAL MANUAL FOR ENGINEERS AND SCIENTISTS
Mu Hao Wang, Lawrence K. Wang, and Wan-Yung W. Chan Nov. 1979 92 p Sponsored by ASCE
(PB80-143266; SIT-ME/11-79-3) Avail: NTIS HC A05/MF A01 CSCL 14B

The technical manual was prepared as a supplemental reference material for engineering and science students at Stevens Institue of Technology. The manual includes detailed conversion factors for both metric and British units, physical constants, temperature equivalent graph, dissolved oxygen nomograms, barometric pressure tables, saturation vapor pressure table, tables on water and air properties, gas density graph, Manning nomograph, Hazer Williams nomograph, partial flow diagram, screen scales table, and element table with atomic weights. GRA

N80-25499# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
MATERIALS COATING TECHNIQUES
Mar. 1980 186 p refs Lecture held in Lisbon, 27-28 Mar. 1980, in Athens, 31 Mar. - 1 Apr. 1980 and in Ankara, 3-4 Apr. 1980
(AGARD-LS-106; ISBN-92-835-1357-6) Avail: NTIS HC A09/MF A01

A review of the principles and the present state of the art of applying metallic, ceramic, and organic layers for the purposes of protection of engineering materials from the effects of corrosion, erosion, and wear is presented. The resultant structure and properties of the coating layers and their interaction with the bulk material is considered. The behavior of coated parts, as determined by the coating technique and material, and the effects in service of such aspects as corrosion, fatigue, tribology problems, and structural stability are considered. Techniques for the analysis and nondestructive evaluation of the composition properties and soundness of the layers are assessed. For individual titles, see N80-25500 through N80-25509.

N80-25500# California Univ., Los Angeles. School of Engineering and Applied Science.
HIGH RATE PHYSICAL VAPOR DEPOSITION PROCESSES
R. F. Bunshah *In* AGARD Mater. Coating Tech. Mar. 1980 16 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

The physical vapor deposition processes, evaporation, ion plating, and sputtering are reviewed. The deposition of metals, alloys, intermetallic compounds, and refractory compounds by these processes is discussed. The evolution of the microstructure and the influence of process parameters such as deposition temperature and gas pressure are presented and illustrated with examples. Texture and residual stresses in the deposit are considered. E.D.K.

N80-25501# Salford Univ. (England). Dept. of Aeronautical and Mechanical Engineering.
PLASMA AIDED TECHNIQUES
Dennis G. Teer *In* AGARD Mater. Coating Tech. Mar. 1980 13 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

The adhesion, crystallinity, and grain structure of coatings deposited by physical vapor deposition techniques are usually improved if the energy of the depositing particles is increased. Energy can be transferred to the coating atoms by heating the substrate. An alternative method is to increase the kinetic energy of deposition by ionizing the vapor atoms and accelerating them in an electric field. A variety of plasma aided techniques are described and it is shown that all the improvements brought about by high temperature substrates can be achieved at lower substrate temperatures. The very high ion energies can also cause production of unusual phases and a further advantage is the increased reactivity resulting in deposition of compound coatings. E.D.K.

N80-25502# Balzers Aktiengesellschaft (Liechtenstein).
TECHNIQUES OF CHEMICAL VAPOR DEPOSITION
A. J. Perry and N. J. Archer (Fulmer Research Inst. Ltd.) *In* AGARD Mater. Coating Tech. Mar. 1980 16 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

Chemical vapor deposition (CVD) which utilizes gas phase chemical reactions to produce metallic and ceramic coatings is described. The technique is used to form thin layers of refractory carbides for wear resistance, layers of metals for corrosion and oxidation resistance, and is also a forming technique which permits the fabrication of complex shapes, particularly in high temperature materials. Chemical vapor deposition depends upon a localized chemical reaction and so it is able to coat complex shapes, particularly internal surfaces. However, the reactions currently used for CVD require high reaction temperatures and this causes many limitations in terms of the substrates which may be coated. The equipment used and the properties of the materials produced are reviewed. E.D.K.

N80-25503# Dortmund Univ. (West Germany).
SPRAYED COATINGS
H.-D. Steffens *In* AGARD Mater. Coatings Tech. Mar. 1980 29 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

Thermal spraying is shown to be an efficient means for the protection of surface areas against elevated temperature, wear, corrosion, hot gas corrosion, and erosion in structural aircraft components. Particularly in jet engines, numerous parts are coated by flame, detonation, or plasma spraying techniques. The applied methods of flame, detonation, and plasma spraying are explained, as well as electric arc spraying. Possibilities for spray coatings which meet aircraft service requirements are discussed, as well as methods for quality control, especially nondestructive test methods. In particular, coating characteristics and properties obtained by different spray methods are described, and special attention is paid to low pressure plasma spraying. E.D.K.

N80-25504# Fiat Research Center, Orbassano (Italy).
LASER SURFACE ALLOYING
P. G. Cappelli *In* AGARD Mater. Coating Tech. Mar. 1980 13 p (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

Techniques based on high power lasers, which modify the chemical composition of the microstructure of the surface of a material in order to improve some of its properties are considered in terms of solving both the high melting point and segregation problems in the fabrication of metal and ceramic alloys. Application of these lasers in such materials processing areas as deep penetration autogeneous welding, cutting, drilling, transformation hardening, and experimental shock hardening is discussed. It is shown that the high power densities that lasers can produce, equivalent to thermal sources of temperature above 20,000 C, facilitate the melting of all phases of the alloy. Furthermore, the high power density of lasers allows melting to be localized at the surface, with negligible subsurface heating, thereby establishing high cooling rates. In this process, laser glazing, the extremely rapid chill rates of thin molten zones produce extremely homogeneous metallurgical microstructures, including amorphous alloys, the ultimate in alloy homogeneity. E.D.K.

N80-25505# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
CORROSION PROTECTION BY ELECTRO-DEPOSITED ALUMINUM
Richard Suchentrunk *In* AGARD Mater. Coating Tech. Mar. 1980 25 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

Deposition of aluminum on various substrates by using a nonaqueous organic electrolytic system is described. The metallic deposit has a high purity and good corrosion protection properties. It can be used as a substitute for the highly toxic cadmium. Possible fields of application are protection against corrosion of high strength steels without any danger of hydrogen embrittlement, the coating of lightweight materials like aluminum, magnesium, and titanium alloys, and the fabrication of fiber reinforced metal matrix composites. E.D.K.

N80-25506# California Univ., Berkeley. Lawrence Berkeley Lab.
OVERLAY COATINGS FOR GAS TURBINE AIRFOILS
Donald H. Boone *In* AGARD Mater. Coating Tech. Mar. 1980 13 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

The degradation modes associated with gas turbine operation under a variety of conditions are reviewed as a preliminary to defining the needs of protective airfoil coatings and processing techniques. These requirements and present coating procedures are briefly described as an introduction to the need for overlay type coatings in general and electron beam (EB) evaporation processed coatings in particular. A discussion of the features of production EB coaters is followed by a detailed description of the individual coating processing steps involved. While most are identical to other coating procedures, a few are significantly different and are discussed in detail. Current overlay coating compositions and their use and experience are reviewed. Future directions in overlay coating processing and composition including electron beam-physical vapor deposition applied ceramics are discussed. E.D.K.

N80-25507# Dortmund Univ. (West Germany).
APPLICATIONS OF SPRAYED COATINGS
H.-D. Steffens and M. Malik (Deutsche Lufthansa A.G., Hamburg, West Germany) *In* AGARD Mater. Coating Tech. Mar. 1980 12 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

Service demands of the coating properties of sprayed coatings are classified as: preventing, fretting, wear, and corrosion; controlled abradability; and thermal barrier. Developments in both coating techniques and coating materials which have allowed production of coatings which match the performance demands are considered. Applications of sprayed coatings in aircraft components are discussed. E.D.K.

N80-25508# Balzers Aktiengesellschaft (Liechtenstein).
WEAR RESISTANT COATINGS MADE BY CHEMICAL VAPOUR DEPOSITION
A. J. Perry and N. J. Archer (Fulmer Research Inst. Ltd.) *In* AGARD Mater. Coating Tech. Mar. 1980 12 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

The methods by which hard layers are formed by chemical vapor deposition and the properties of these hard materials are reviewed. The economics of chemical vapor deposition are discussed as this is an extremely attractive aspect of the process for large batches of small components. E.D.K.

N80-25508# California Univ., Los Angeles. School of Engineering and Applied Science.
APPLICATIONS OF PHYSICAL VAPOR DEPOSITION PROCESSES
R. F. Bunshah *In* AGARD Mater. Coating Tech. Mar. 1980 10 p refs (For primary document see N80-25499 16-31)
Avail: NTIS HC A09/MF A01

The applications of physical vapor deposition processes are discussed. They are coatings for decorative applications, heat/energy barriers, microelectronic devices, corrosion of aircraft parts, high temperature corrosion, tribological phenomena, cutting tools, optical components, thin transparent conductive layers, and materials conservation. The fabrication of self supporting shapes and potential applications are given. E.D.K.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N80-25510 Radio Technical Commission for Aeronautics, Washington, D. C.
VHF AIR-GROUND COMMUNICATION TECHNOLOGY AND SPECTRUM UTILIZATION
20 Jul. 1979 58 p
(RTCA/DO-169) Avail: Radio Technical Commission for Aeronautics, Suite 655, 1717 H Street, N.W., Washington, D.C. 20006

The best modulation technique to provide the most suitable air-ground voice communications is identified. The possible use of data transfer on some channels is included. The technical feasibility and transition problems of any proposed channel splitting scheme is addressed. Cost of airborne and ground equipment are also considered. R.C.T.

N80-25511 Radio Technical Commission for Aeronautics, Washington, D. C.
MINIMUM PERFORMANCE STANDARDS: EMERGENCY LOCATOR TRANSMITTERS: AUTOMATIC FIXED-ELT (AF), AUTOMATIC PORTABLE-ELT (AP), AUTOMATIC DEPLOYABLE-ELT (AD) OPERATING ON 121.5 AND 243.0 MEGAHERTZ
26 Jan. 1979 49 p Supersedes DO-147
(RTCA/DO-168; DO-147) Avail: Radio Technical Commission for Aeronautics, Suite 655, 1717 H Street, N.W., Washington, D.C. 20006

The minimum performance standards for automatic fixed, automatic portable, and automatic deployable type emergency locator transmitters are developed. The transmitters were tested in all conditions normally encountered in search and rescue operations. All of the components necessary for the equipment to properly perform its intended function were evaluated. R.C.T.

N80-25512 British Broadcasting Corp., Kingswood (England). Engineering Dept.
CARFAX: AN EXAMPLE OF AN FM SIGNAL GENERATED USING DIGITAL TECHNIQUES
P. Shelswell Mar. 1980 10 p refs
(BBC-RD-1980/2) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, England

A method is described for generating frequency-modulated signals using digital techniques. The digital process introduces little distortion and provides a stable centerfrequency. The drive for a CARFAX transmitter is described as an example of its application. Author

N80-25513 Radio Technical Commission for Aeronautics, Washington, D. C.
VHF AIR-GROUND TECHNOLOGY AND SPECTRUM UTILIZATION
8 Jun. 1979 58 p
(RTCA-155-79/SC140-17-Rev) Avail: Radio Technical Commission for Aeronautics, Suite 655, 1717 H Street, N.W., Washington, D.C. 20006

One of the recommendations of the RTCA Aviation Service Working Group (ASWG), set up at the FCC's request to coordinate nongovernment participation in the U. S. preparatory work for the ITU 1979 General World Administrative Radio Conference, was that an additional 2 MHz of VHF spectrum contiguous to the currently allocated 118-136 MHz band be assigned to the Aeronautical Mobile Service to help meet the expected demand for additional channels towards the end of the century. The Special Committee found the new spectrum will, in addition to more channels, facilitate the implementation of a further reduction of channel spacing in the present spectrum. SC-140 recommends that reduced channel spacing (possibly 12.5 kHz) be employed in the new spectrum, with continued use of amplitude modulation. Significant economic and operational penalties, with no corresponding spectrum use benefits, would result from the adoption of other modulation techniques. A further benefit of retaining amplitude modulation is the minimization of the technical problems of any subsequent transition to reduced channel spacing in the existing spectrum. F.O.S.

N80-25514 Radio Technical Commission for Aeronautics, Washington, D. C.
AUDIO SYSTEMS CHARACTERISTICS AND MINIMUM PERFORMANCE STANDARDS. AIRCRAFT MICROPHONES (EXCEPT CARBON), AIRCRAFT HEADSETS AND SPEAKERS AND AIRCRAFT AUDIO SELECTOR PANELS AND AMPLIFIERS
30 Nov. 1979 119 p refs
(RTCA-305-79/SC132-54-Rev-2) Avail: Radio Technical Commission for Aeronautics, Suite 655, 1717 H Street, N.W., Washington, D.C. 20006

System audio response characteristics affecting the intelligibility of air-ground speech communication were analyzed. Recommendations for improvement include: speech level improvement, noise reduction, automatic gain control, and microphone positioning so as to minimize interference. F.O.S.

N80-25515 Stanford Univ., Calif.
THE INVERSE SCATTERING PROBLEM FOR PERTURBED WAVE EQUATIONS Ph.D. Thesis
Peter Lawrence Trudinger 1980 79 p
Avail: Univ. Microfilms Order No. 8011721

The inverse problem in scattering theory is the problem of characterizing the scatterer from knowledge of the scattering operator show how the convex hull of the support of the scatter may be recovered for two systems, one characterized by the classical wave equation with a potential and the other by the classical wave equation with variable sound speed and density, in the exterior of an obstacle (possibly empty) in three dimensional Euclidean space with Dirichlet boundary condition. The scatterer is assumed to be compactly supported, so that the equations reduce to the free space wave equation outside a large ball. Also, it is assumed that the potential is square integrable, that the speed and density are smooth positive functions, and that the obstacle has smooth boundary. The results obtained relate the support of the scatterer and the right end point of the support of the scattering kernel. The latter can be calculated from the time taken by a signal incident from one direction to generate a reflected signal in another direction. So then if this is determined for sufficiently many directions of incidence and reflection, the support of the scatterer is known. This enables the reconstruction of the convex hull of the support of the scatterer, even when the perturbation is infinitely differentiable and there is no reflection in the geometrical optics approximation to the solution. Most of the work is concerned with obtaining an asymptotic growth estimate for the transmission coefficient on the positive imaginary axis. In order to do this, various assumptions are made on the perturbation. The most important of these is that the potential be of one sign near the boundary

of its support, and that the speed be uniformly greater than, equal to, or less than one. Dissert. Abstr.

N80-25516 Catholic Univ. of America, Washington, D. C.
NON-GAUSSIAN CHARACTERISTICS OF THE FDM-FM SATELLITE BASEBAND VOICE CHANNEL Ph.D. Thesis
Chester Joseph Wolejsza, Jr. 1980 258 p
Avail: Univ. Microfilms Order No. 8012123

Data on the channel noise characteristics are analyzed for an FDM/FM communications satellite link to develop an analytical or empirical model which can describe the behavior of the channel noise modems used on such channels. In April 1977, a series of noise measurements were made at a satellite Earth station on a dedicated voice channel which was looped back at a remote Earth station. The principle measurements consisted of calibrated recordings of the background noise waveform over a protracted period of time. These noise samples were digitized and analyzed in the laboratory to produce measured exceedance probability functions. As a consequence of the preliminary results analytical models were studied and Middleton's Canonic model for impulse noise was selected as a likely candidate to model the actual measured exceedance probability function. The remaining portion of the research developed procedure for determining the best value of the parameters of the model to fit the model to the data, and a measure of accuracy with which the model fits the data. The results show that there were three classes of noise, near-Gaussian, narrowband speech related interference, and wide-band transient (impulsive) noise. Dissert Abstr.

N80-25517 Texas A&M Univ., College Station.
LOOP YAGI ARRAY ANTENNAS Ph.D. Thesis
Fouad Antoine Raphael 1979 77 p
Avail: Univ. Microfilms Order No. 8011984

A technique for the derivation of the current distribution on array antenna element is presented. The analysis is carried out for an array of loops with arbitrary circumferences and spacings. The simultaneous integral-differential equations describing the array are reduced to a set of linear simultaneous equations by Fast Fourier Transformation and deconvolution of the Freen's function and the driving condition. It is shown that numerical implementation of this solution is relatively simple and requires short computational time and moderate storage memory. The results for simple cases are compared to previously available data. Several computed curves of the gain, front to back ratio, and input impedance corresponding to arrays of two and three element loop atennas are given. Some radiation patterns are also shown. This data is further experimentally substantiated. Dissert. Abstr.

N80-25518 British Broadcasting Corp., Kingswood (England). Engineering Div.
DIGITAL SOUND: AN INVESTIGATION OF DELTA-MODULATION/PULSE-CODE-MODULATION ANALOGUE-TO-DIGITAL CONVERSION
R. A. Belcher, W. I. Manson, and T. A. Moore Mar. 1980 13 p refs
(BBC-RD-1980/3) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, England

An apparatus was built to allow the potential of a sound signal delta modulation to pulse code modulation converter to be assessed practically. An 8 MHz 8 bit digital delta modulation integrator was tested. Addition of triangular dither to the studio input signal was found to improve performance markedly. Results show that a system for which 10 1/2 bit pulse code modulation equivalent quantizing noise was predicted in practice, achieved better than 12 bit equivalent performance with added dither. R.C.T.

N80-25519# National Aviation Facilities Experimental Center, Atlantic City, N. J.
FLIGHT EVALUATION OF A RADAR CURSOR TECHNIQUE Interim Report, Jul. - Aug. 1979
J. Perez Mar. 1980 37 p refs
(FAA Proj. 045-396-130)
(AD-A083027; FAA-RD-80-18; FAA-NA-80-8) Avail: NTIS HC A03/MF A01 CSCL 17/2

Preliminary results are presented of a flight test evaluation of a radar cursor technique to be used as an aid in acquiring and tracking the desired ground track during airborne radar approaches. The test was performed using a Sikorsky CH-53A helicopter. The airborne radar system used was a BENDIX RDR-1400A modified to electronically produce a radar cursor display of course error. Airborne radar approaches were made to an offshore and an airport test environment. The specific purpose of the test was to evaluate the practical utility of the radar cursor as an aid to performing airborne radar approaches. The preliminary conclusion of this test is that the use of the radar cursor improved course acquisition and ground tracking significantly with pilotage errors and total system cross-track errors reduced by one-half or better. The radar cursor technique shows potential in reducing airspace requirements for airborne radar approaches. F.O.S.

N80-25520*# Operations Research, Inc., Silver Spring, Md. Space Engineering and Communication Systems Div.
A PROPAGATION EFFECTS HANDBOOK FOR SATELLITE SYSTEMS DESIGN. A SUMMARY OF PROPAGATION IMPAIRMENTS ON 10-100 GHz SATELLITE LINKS, WITH TECHNIQUES FOR SYSTEM DESIGN Final Report, May 1979 - Mar. 1980
R. Kaul, R. Wallace, and G. Kinal Mar. 1980 392 p refs
(Contract NAS5-25725)
(NASA-CR-163207; ORI-TR-1679) Avail: NTIS HC A17/MF A01 CSCL 20N

This handbook provides satellite system engineers with a concise summary of the major propagation effects experienced on Earth-space paths in the 10 to 100 GHz frequency range. The dominant effect, attenuation due to rain, is dealt with in terms of both experimental data from measurements made in the U.S. and Canada, and the mathematical and conceptual models devised to explain the data. Rain systems, rain and attenuation models, depolarization and experimental data are described. The design techniques recommended for predicting propagation effects in Earth-space communications systems are presented. The questions of where in the system design process the effects of propagation should be considered, and what precautions should be taken when applying the propagation results are addressed in order to bridge the gap between the propagation research data and the classical link budget analysis of Earth-space communications system. A.R.H.

N80-25521*# Axiomatix, Los Angeles, Calif.
CRITIQUE OF THE HUGHES AIRCRAFT SHUTTLE Ku BAND LEADING EDGE BIT SYNCHRONIZER Interim Report
J. K. Holmes 5 May 1980 17 p refs
(Contract NAS9-15795)
(NASA-CR-160661; R8005-2) Avail: NTIS HC A02/MF A01 CSCL 17B

A bit synchronizer is analyzed via timing diagrams in a noise-free environment. It is believed that this new bit synchronizer will track the rising edge of the data bits with 25% asymmetry and up to a 90 deg phase shift between the received clock and data bit timing. In addition, the data bits will be demodulated correctly. It is not true that phase shifts larger than 90 deg will necessarily be corrected by this bit synchronizer. However, the specifications currently require the loop to operate over only a + or - 75 deg phase shift between the received data stream leading edges and the bit synchronizer leading edges; consequently, there should be no problem. A.R.H.

N80-25522*# Axiomatix, Los Angeles, Calif.
SHUTTLE Ku-BAND AND S-BAND COMMUNICATIONS IMPLEMENTATION STUDY Final Report
James G. Dodds, Gaylord K. Huth, Peter W. Nilsen, Andreas Polydoros, Marvin K. Simon, and Charles L. Weber 21 May 1980 274 p refs
(Contracts NAS9-15240E; NAS9-15240F)
(NASA-CR-160662; R8005-3) Avail: NTIS HC A12/MF A01 CSCL 17B

Various aspects of the shuttle orbiter S-band network communication system, the S-band payload communication system, and the Ku-band communication system are considered. A method is proposed for obtaining more accurate S-band antenna patterns of the actual shuttle orbiter vehicle during flight because the preliminary antenna patterns using mock-ups are not realistic that they do not include the effects of additional

appendages such as wings and tail structures. The Ku-band communication system is discussed especially the TDRS antenna pointing accuracy with respect to the orbiter and the modifications required and resulting performance characteristics of the convolutionally encoded high data rate return link to maintain bit synchronizer lock on the ground. The TDRS user constraints on data bit clock jitter and data asymmetry on unbalanced QPSK with noisy phase references are included. The S-band payload communication system study is outlined including the advantages and experimental results of a peak regulator design built and evaluated by Axiomatrix for the bent-pipe link versus the existing RMS-type regulator. The nominal sweep rate for the deep-space transponder of 250 Hz/s, and effects of phase noise on the performance of a communication system are analyzed.
A.R.H.

N80-25523# Federal Aviation Administration, Atlantic City, N.J.
RADAR MICROWAVE LINK (RML) ELECTROMAGNETIC COMPATIBILITY MEASUREMENTS Final Report, Feb. - Jul. 1979
James G. Dong Mar. 1980 21 p
(FAA Proj. 213-062-B60)
(AD-A083072; FAA-RD-80-11; FAA-NA-80-2) Avail: NTIS HC A02/MF A01 CSCL 20N

Two different microwave relay transmitter and receiver combinations operating in the frequency ranges of 7.125 to 8.4 GHz and 14.4 to 15.25 GHz were tested. Measurements to determine interference characteristics included: receiver off channel rejection; receiver intermodulation; transmitter spectrums; transmitter intermodulation; and second harmonics. Results indicate that adjacent frequency spacing should be at least 20 MHz and 50 MHz for radar microwave link-4 and TerraCom equipment, respectively. Additional measurements are recommended on new equipment in the 14.4 to 15.25 GHz range for valid criteria for the handbook in preparation.
R.C.T.

N80-25524# General Dynamics/Electronics, San Diego, Calif.
WAVE PROPAGATION THROUGH AXIALLY-SYMMETRIC DIELECTRIC SHELLS Final Report
G. Tricoles and E. L. Rope Feb. 1980 47 p refs
(Contract N00019-78-C-0594)
(AD-A082378; R-80-008) Avail: NTIS HC A03/MF A01 CSCL 20/14

Section 1 describes a technique estimating the amplitude and phase of guided waves excited on finite dielectric slabs by incident plane waves. The procedure is based on the moment method, but it extends that method by postulating an explicit form for the guided waves and solving for the guided wave amplitudes. The method solves for the two guided waves that travel in opposite directions parallel to the slab. Experiment verified the technique. Section 2 describes nearfield scattering by a finite, solid, dielectric cylinder. Incidence was broadside. The procedure extends the theory originally developed by Richmond. It identifies the effects from the ends of the cylinder. Experiment verified the procedure for polarization parallel or perpendicular to the cylinder. Section 3 describes a new technique for nearfield scattering by a hollow dielectric cylinder. The moment method was used but the cells were finite angular sectors. This is a new shape. Singularities of integrands were integrable. Experiment verified our approximate theory, especially when a correction for the pattern of the probe antenna was utilized.
GRA

N80-25525# SRI International Corp., Menlo Park, Calif.
ATS-6 MEASUREMENTS DURING AVEFRIA Final Report, 9 Jan. - 15 Dec. 1979
Alan A. Burns Aug. 1979 31 p
(Contract DNA001-78-C-0132)
(AD-A082192; AD-E300688; DNA-5044F) Avail: NTIS HC A03/MF A01 CSCL 20/14

An experimental program was conducted to measure dispersive-phase and amplitude perturbations caused by the AVEFRIA shaped-charge barium release series. The 360 and 1550 MHz signals from the ATS-6 geostationary satellite were used for those measurements. A novel technique, whereby the ATS-6 communications subsystem was phase locked to ATS-6 RF beacon, provided a 3950 MHz reference signal for the dispersive phase measurements. Four occultations were achieved during the two AVEFRIA events. Durations of strong effects were as long as four minutes, and some perturbations lasted until T+20 m during one occultation. The greatest amplitude fluctuations measured were +5 to -10 dB at 360 MHz. Maximum estimated phase excursions were about 1 radian at UHF, which corresponds to electron content changes of 4 x 10 to the 10th power electrons/sq cm.
GRA

N80-25526# Sandia Labs., Albuquerque, N. Mex.
MISSILE CIRCUMFERENTIAL CURRENT DENSITY FOR PLANE WAVE ELECTROMAGNETIC FIELD ILLUMINATION
Charles W. Harrison, Jr. 7 Jul. 1970 20 p refs Sponsored by DOE
(AD-A082763; SC-R-70-4324) Avail: NTIS HC A02/MF A01 CSCL 20/14

The study of shadowing of plane wave electromagnetic fields by missiles is of importance because RF leakage into a missile through holes and slots in the wall and the RF pickup of cables furrowed into the skin leading to interior circuitry depends on the amplitude and the variation of current density along the circumference of the scattering obstacle. Clearly the azimuthal orientation of the missile with respect to the incident field has a bearing on the RF receiving characteristics of the slots and cables, if indeed electromagnetic field shadowing is significant. One topic discussed briefly in this memoradum is a theory for shadowing by tubular cylinders of arbitrary dimensions developed by Kao. As a practical matter, the coupled integral equations derived by him cannot readily be solved for very long cylinders because of the limited number of storage locations in a computer. To circumvent this, the author presents a theory for shadowing by a cylinder of infinite length. In the entire discussion of both finite and infinite tubes, it is assumed that the electric field is polarized parallel to the axis of the cylinder. This is the case of dominate interest in the field of RF hazards to ordnance. But this specific polarization is an unnecessary restriction. The angle the incident field makes with the axis of the cylinder may be arbitrary. In particular, the magnetic field may be polarized parallel to the conductor.
GRA

N80-25527# Lincoln Lab., Mass. Inst. of Tech., Lexington.
WIDEBAND ADAPTIVE ANTENNA NULLING USING TAPPED DELAY LINES
Joseph T. Mayhan, Alan J. Simmons, and William C. Cummings 26 Jun. 1979 93 p refs
(Contract F19628-78-C-0002; AF Proj. 2029)
(AD-A082854; TN-1979-45; ESD-TR-79-162) Avail: NTIS HC A05/MF A01 CSCL 09/5

For some applications, it is desirable to have an antenna which can adaptively form antenna pattern 'nulls' in the directions of a collection of interference sources. These nulls are generally required to be below some specified level of directive gain over the entire system bandwidth. Typically the nulls are formed by adaptively weighting each output of an N-port antenna, such as an N-element array. For large arrays operating over wide percentage bandwidths, some sort of frequency compensation is required at each output port to accomplish broadband nulling. One technique commonly used is to employ a 'tapped' delay line at each element output, with controllable weights (frequency independent) at the output of each tap. The objective of this report is to develop some insight into the way in which delay line compensation leads to improved performance, to develop some quantitative estimates of how performance varies with antenna and delay line parameters, and to develop some tools useful in the performance evaluation of frequency dependent weighting. Practical considerations dictate that only a minimum number of taps/element be utilized. A primary consideration is to minimize the number of taps required for a specific system performance. With this objective in mind, we develop an analytic solution characterizing the two element array, employing a two tap delay line with each element. This provides valuable insight into the mechanism of delay line compensation.
GRA

N80-25528# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A SIMPLE GRAPHICAL MODEL FOR ANALYZING RADAR HOMING INTERCEPTOR ENGAGEMENTS
Stephen D. Weiner 17 Dec. 1979 51 p ref
(Contract F19628-80-0002)
(AD-A082460; TN-1979-82; ESD-TR-79-284) Avail: NTIS HC A04/MF A01 CSCL 17/7

In this note, a simplified model of radar homing interceptor engagements is described. This model permits analysis of the interaction among sensor parameters such as angular accuracy and acquisition range, interceptor parameters such as maneuver limits and response time and system parameters such as closing velocity and handover accuracy. Simple expressions are obtained for the sensor prediction accuracy using various types of range-dependent measurement errors. These include glint, instrumentation error and thermal error for both active and semiactive sensors. A simple graphical technique is used to determine the feasibility of a homing engagement and to estimate the resulting miss-distance. A set of nomograms is included to permit full variation of the system and component parameters.
GRA

N80-25529# California Univ., Livermore. Lawrence Livermore Lab.
ELASTIC-WAVE RADIATION FROM SPHERICAL SOURCES
Howard C. Rodean 7 Dec. 1979 28 p refs
(Contract W-7405-eng-48)
(UCRL-52867) Avail: NTIS HC A03/MF A01

The radiation of spherical compressional waves from a spherical cavity in an ideal elastic solid is treated. The equations for radiation source and field are written in terms of the reduced displacement potential. The source equation is studied in terms of characteristic frequencies, corresponding periods and wavelengths, and damping. The field equations for the stresses, strains, radial displacement, etc., are reviewed with regard to the transitions between the near and far fields. The natural parameters for defining the dynamic source and field characteristics are 2b/R and b/a in some cases and a/R in others, where a is the compressional-wave velocity, b the shear-wave velocity, and R the cavity radius. Transient solutions for stresses, strain, radial displacement, etc., include damped sinusoidal oscillations. The initial and final value theorems for the Laplace transform are used to obtain solutions for tau(reduced time) yields 0 + (high frequency, farfield) and tau yields infinity (zero frequency, near-field).
DOE

N80-25530# California Univ., Livermore. Lawrence Livermore Lab.
STUDY OF NONLINEAR WAVES DESCRIBED BY THE CUBIC SCHROEDINGER EQUATION Ph.D. Thesis
Authur Eugene Walstead 12 Mar. 1980 245 p refs
(Contract W-7405-eng-48)
(UCRL-52920) Avail: NTIS HC A11/MF A01

The properties of the uniformly transiating periodic wave solutions of the one dimensional cubic Schroedinger equation (CSE) are examined. Explicit expressions for the characteristic velocities of the modulational equations are obtained for the full set of cnoidal waves. The results for several nontrivial limiting cases agree with those obtained by independent methods. The dynamics of the CSE generalized to two spatial dimensions are studied for the unstable case. A large class of similarity solutions with cylindrical symmetry are obtained systematically using infinitesimal transformation group techniques. The methods are adapted to obtain the symmetries of the action of functional of the CSE and to deduce nine integral invariants. A numerical study of the self-similar solutions reveals that they are modulationally unstable and that singularities dominate the dynamics of the CSE in two dimensions. The CSE is derived using perturbation theory for a specific problem in plasma physics: the evolution of the envelope of a near-monochromatic electromagnetic wave in a cold magnetized plasma.
DOE

N80-25531# National Technical Information Service, Springfield, Va.
SATELLITE TELEVISION. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1975 - 1979
William E. Reed Mar. 1980 120 p
(PB80-806318) Avail: NTIS HC $30.00/MF $30.00 CSCL 17B

This bibliography cites 113 abstracts concerning various aspects of satellite television systems. Topics include television broadcasting, television transmission, educational television, regulation, frequency allocations, equipment, and applications.
GRA

N80-25532# National Technical Information Service, Springfield, Va.
SATELLITE TELEVISION TRANSMISSION. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1975 - 1979
William E. Reed Mar. 1980 152 p
(PB80-806318) Avail: NTIS HC $30.00/MF $30.00 CSCL 17B

The bibliography cites 145 abstracts concerning various aspects of satellite television systems. Topics include television broadcasting, television transmission, educational television, frequency allocations, equipment, and applications.
GRA

N80-25533# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
UPDATE: LOCAL AREA NETWORKS Final Report
Robert Rosenthal, ed. and Norman B. Meisner, ed. 1979 347 p refs Presented at Local Area Commun. Network Symp., Boston, 7-9 May 1979 Sponsored in part by Mitre Corp.
(PB80-152903) Avail: NTIS HC A15/MF A01 CSCL 17B

An overview of local area networks, nondefense networks, and local area network technology are presented along with a discussion of defense-related networks, and future environments. Workshop summaries are included.
GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N80-25534 Rensselaer Polytechnic Inst., Troy, N. Y.
PARALLEL PROCESSING ALGORITHMS FOR THE IDENTIFICATION, ESTIMATION AND CONTROL OF NONLINEAR DYNAMICAL SYSTEMS Ph.D. Thesis
Richard H. Travassos 1979 238 p
Avail: Univ. Microfilms Order No. 8011513

A collection of parallel identification, estimation, and control algorithms were developed which are suitable for implementation on an advanced computer with the facility for large scale parallel processing. Parallel procedures were presented which utilize nonlinear process equations directly. The identification, estimation, and control algorithms also employ parallel minimization algorithms to accelerate convergence, parallel methods for integrating ordinary differential equations to speed up computations, and a procedure based upon partitioning the integration interval to improve accuracy and reduce the sensitivity of the solution.
Dissert. Abstr.

N80-25535 Radio Technical Commission for Aeronautics, Washington, D. C.
RECOMMENDATIONS ON POLICIES AND PROCEDURES FOR OFF-THE-SHELF ELECTRONIC TEST EQUIPMENT ACQUISITION AND SUPPORT
5 Dec. 1979 51 p
(RTCA-307-79/SC134-69) Avail: Radio Technical Commission for Aeronautics, Suite 655, 1717 H Street, N.W., Washington, D.C. 20006

Recommendations are presented on various topics concerning general purpose electronic test equipment, which are applicable to both government and industry users and manufacturers. The topics considered by the Committee are problem-oriented. The rationale and recommendations, if used, would be of major benefit to those responsible for the drafting of legislation, policies, procedures and guidelines for the acquistion and support of electronic test equipment. All government and industry users, as well as test equipment manufacturers and suppliers, should find these reports educational and beneficial. If applied, these recommendations would promote the objective of catalyzing further improvements in the acquistion and support process. The study and use of the information and these recommendations is encouraged.
F.O.S.

N80-25536 Stanford Univ., Calif.
THE USE OF MECHANICAL ALLOYING IN THE MANUFACTURE OF MULTIFILAMENTARY SUPERCONDUCTOR WIRE Ph.D. Thesis
Richard Longstreth White 1980 159 p
Avail: Univ. Microfilms Order No. 8011726

Mechanical alloying, a high energy ball milling technique, was used to process elemental metal powders. Multifilamentary Cu-Nb3Sn composites were formed by mixing the mechanically alloyed Nb/Sn powders with Cu powders, isostatically compacting the mixture, hydrostatically extruding to wire form, and diffusion reacting to form the A15 superconducting compounds from the mechanically alloyed powders. Superconducting transition temperature (Tc'S) as high as 18.0 K were recorded for uniaxially compacted and vacuum reacted MA Nb/Sn powders. It was determined that to optimize the critical current density (J sub c) of the composite wire. Nb and Sn powders must be processed in a 30 at . % Sn ratio. Nevertheless J sub c s as high as 800 amps/sq cm in an applied field of 3 Tesla were recorded.
Dissert. Abstr.

N80-25537 New Mexico Univ., Albuquerque.
DIGITAL SIGNAL PROCESSING WITH AN ADAPTIVE DELAY ELEMENT Ph.D. Thesis
Delores Maria Etter 1979 117 p
Avail: Univ. Microfilms Order No. 8012545

A new element, the adaptive delay, is developed as a means for synchronizing two signals that are highly correlated. An LMS error function is derived and gradient techniques are used to determine an adaptive delay algorithm. Like Widrow's adaptive filter coefficient algorithm, this adaptive delay algorithm does not explicitly utilize a priori statistics on the input signals. However, unlike the LMS error function for the adaptive filter, the LMS error function for the adaptive delay is not quadratic. Thus, the error function will be required to be unimodal in order to assure convergence of the adaptive delay to its optimum value. Further analysis of the adaptive algorithm determines when the gradient estimates is biased and gives bounds for the convergence parameter. Applications presented include delay-lock loops, frequency tracking, and seismic noise-canceling. The new adaptive element is significant in that, in certain situations, it can either replace entire adaptive filters or be used with a small adaptive filter and still minimize the error. In some configurations, the adaptive delay yields information not easily discernable from either adaptive filters or Wiener filters. Futhermore, while the simple adaptive algorithm requires a small amount of memory storage, it does not require squaring, differentiating, averaging, or the use of transforms, thus making it very attractive for use in micro-processor-based systems.
Dissert. Abstr.

N80-25538*# National Aeronautics and Space Administration. Pasadena Office, Calif.
STARK EFFECT SPECTROPHONE FOR CONTINUOUS ABSORPTION SPECTRA MONITORING Patent Application
Michael J. Kavaya, inventors (to NASA) (JPL) Filed 30 May 1980 16 p
(Contract NAS7-100)
(NASA-Case-NPO-15102-1; US-Patent-Appl-SN-154726) Avail: NTIS HC A02/MF A01 CSCL 09A

A Stark effect spectrophone is provided with a pulsed or continuous wave laser for monitoring the constituents of an unknown gas. The laser beam is directed through windows of a closed cell while the unknown gas to be monitored is caused to flow continuously through the cell between electric field plates disposed in the cell on opposite sides of the beam path through the cell. The plates are so disposed as to be divergent, e.g., flat plates at an oblique angle relative to each other, or plates shaped according to a mathematical function, so that with constant voltage applied across the plates there is a variation in electric field strength along the beam path. Discrete energy absorption sensors are positioned at field strength points of interest. When a beam is passed through the cell, energy absorbed by the gas then present in the cell will increase gas pressure and temperature at each point along the beam path according to the spectral lines of the constituents of the gas for the particular field strengths at those points. This increase is sensed at each point simultaneously while modulating the absorption of the beams energy by the gas sample in the cell.
NASA

N80-25539# RCA Solid State Div., Somerville, N.J.
HIGH RELIABILITY, LOW COST INTEGRATED CIRCUITS, PHASE 2 DEVELOPMENT REPORT Final Report, 3 Feb. 1977 - 22 May 1979
22 May 1979 124 p
(Contract N00039-76-C-0240; XF54586002)
(AD-A081666) Avail: NTIS HC A06/MF A01 CSCL 09/5

The objectives of phase 2 of this investigation were to fabricate significant quantities of eight integrated circuit types using the techniques defined in phase 1 (see phase 1 final development report for high reliability, low cost integrated circuits), perform a preliminary reliability investigation, and formulate comparative cost data. Wafers and finished devices were processed for eight integrated-circuit types. These types included three TTL circuits (5420, 5472, 5470), one Schottky TTL circuit (54S20), three CMOS circuits (CD4012B, CD4014A, CD4027A) and one linear circuit (CA741). The preliminary reliability investigations defined potential reliability problems, which were subsequently successfully resolved, and provided preliminary data regarding activation energies and failure rates. The comparative cost analysis indicated that the cost goal of the contract can be met.
GRA

N80-25540# Army Aviation Research and Development Command, St. Louis, Mo. Applied Technology Lab.
COMPARISON OF ONBOARD AIRCRAFT NICAD BATTERY CHARGERS Progress Report, Jun. 1978 - May 1979
J. D. Dickinson Jan. 1980 95 p refs
(DA Proj. 1L1-62209-AH-76)
(AD-A082515; USAAVRADCOM-TM-80-D-5) Avail: NTIS HC A05/MF A01 CSCL 10/3

A test was conducted at the Applied Technology Laboratory at Fort Eustis, Virginia to establish the performance characteristics of several onboard aircraft NiCad battery chargers. The test assessed performance characteristics of chargers from Utah Research and Development Company, Aerospace Avionics Corp., Eldec Corp., and Chrysler Corp. These performance characteristics were also compared to the battery performance associated with a simulated aircraft bus charging source. Adjunct tests investigated battery maintenance procedures.
GRA

N80-25541# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
NANOSECOND PULSERS FOR MM WAVE TUBES
J. Stover, N. Komatsu, and A. Nieto Feb. 1980 18 p
(Contract DAAB07-78-C-2991; DA Proj. 1L1-62705-AH-94)
(AD-A080990; HAC-FR-79-14-353; IR-2; DELET-TR-78-2991-2) Avail: NTIS HC A02/MF A01 CSCL 09/5

The AVG avalanche transistor has been selected as the switching element for the nanosecond pulsers. Still open for consideration is a high voltage (400 V) VMOS FET that will be available shortly for evaluation of that device operating in avalanche mode.
GRA

N80-25542# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
NANOSECOND PULSERS FOR MM WAVE TUBES Interim Report, Jun. - Sep. 1979
J. Stover, N. Komatsu, and A. Nieto Feb. 1980 23 p
(Contract DAAB07-78-C-2991; DA Proj. 1L1-62705-AH-94)
(AD-A080966; HAC-FR-79-14-1376; DELET-TR-78-2991-3; IR-3) Avail: NTIS HC A02/MF A01 CSCL 09/5

A pulser with turn on-turn off switching capability in the nanosecond region has been fabricated and is presently in the preliminary stage of evaluation. The unit is designed to deliver a 1000 V pulse into a 50 ohm resistive load.
GRA

N80-25543# TRW Defense and Space Systems Group, Redondo Beach, Calif. Microelectronics Center.
HIGH FREQUENCY ANALOG LSI DEVELOPMENT Annual Interim Report, 1 Sep. 1978 - 12 Nov. 1979
C. A. West and J. Choma, Jr. 12 Nov. 1979 251 p refs
Prepared for Naval Electronic Systems Command, Washington, D.C.
(Contract N00123-77-C-1045)
(AD-A082664; TRW-30491-6014-RU-00; NOSC/TR-5) Avail: NTIS HC A12/MF A01 CSCL 09/5

This report documents all design and related analysis efforts

undertaken in the second year of a three year program aimed toward utilizing OAT fabrication technology to develop building block circuits which satisfy the system requirements of communication networks operating through L-band signal frequencies. The designs of a wideband RF amplifier, narrowband IF amplifier, four quadrant analog multiplier, wideband operational amplifier, and high frequency voltage controlled oscillator are discussed at considerable depth, and the available experimental characterizations of these units are documented. As a prelude to circuit design discussions, the theories of bandwidth estimation, RF power flow, stability, and interstage coupling are rigorously developed and explained. These theories form the foundation upon which the circuit design methodology is structured. GRA

N80-25544# TRW Defense and Space Systems Group, Redondo Beach, Calif.

SURFACE ACOUSTIC WAVE MICROWAVE OSCILLATOR AND FREQUENCY SYNTHESIZER Interim Report, 1 Apr. - 1 Oct. 1979

M. Y. Huang and D. J. Dodson, Jr. Jan. 1980 120 p refs

(Contract DAAB07-78-C-2992)

(AD-A082351; DELET-TR-78-2992-2; IR-2) Avail: NTIS HC A06/MF A01 CSCL 09/5

The objective of the program is the development of Surface Acoustic Wave (SAW) oscillator and synthesizer technology. The two year effort is planned as follows: task 1 - development of SAW devices for oscillator applications at microwave (L-band) frequencies. Emphasis will be placed on achieving wideband tuning capabilities, improved oscillator stability performance and reduced power requirements. Task 2 - investigate UHF surface acoustic wave devices which can best impact on synthesizer performance parameters such as: switching speed, minimum frequency step size, total achievable bandwidth, short, medium and long term stability as well as maximum suppression of spurious mode level. Concurrently promising new synthesizer designs will be studied on the basis of these designs to arrive at target specification in a package providing a significant reduction is size, weight and power consumption. During the second six months of the program, the microwave oscillator design has been completed. A breadboard version of the circuit has been fabricated and is being evaluated. The oscillator design consists of a bank of four selectable SAW delay lines with passbands around 560 MHz, a varactor tuned quadrature hybrid phase shifter, a three stage loop amplifier, a transistor frequency tripler, and a power amplifier. An injection locked oscillator has also been developed to use in place of the power amplifier. Work on the frequency synthesizer was also initiated. GRA

N80-25545# Raytheon Co., Waltham, Mass. Microwave and Power Tube Div.

DIAMOND TECHNOLOGY STUDY Final Report, Jun. 1975 - Jan. 1979

11 Jun. 1979 101 p refs

(Contract N00039-75-C-0451)

(AD-A081928; PT-5413) Avail: NTIS HC A06/MF A01 CSCL 09/1

A comprehensive study has been conducted into the use of diamond as a TWT helix support material to increase the average output power capability of broadband high frequency helix TWT's. A survey of the progress from the inception of diamond supported helix work in 1971, at Raytheon, to the present is presented. Methods for constructing diamond supported helices using compression, brazed, and diffusion bonded interfaces are described. The construction and test of experimental helix assemblies of all three types are described, and it is shown that a compression supported helix is most practical to design and build. Test results on compression-type copper plated tungsten helix assemblies are presented showing power dissipations of 1800 watts per inch for solenoid focused I-band helices and 500 watts per inch for PPM focused K-band helices. The emphasis was on development of practical engineering design technology. A simple analysis procedure is described using thermal resistance methods for accurately calculating the temperature rise of a TWT helix for a given power dissipation. Correlation of calculated values with experimental results was good. This shows that the analysis method is accurate, and that the construction techniques used achieved the theoretical capability of the diamond supported helix. Detailed descriptions of the experimental results and methods are presented. GRA

N80-25546# Argonne National Lab., Ill.

COMPARISON OF FLYING COMPACITOR BRIDGE CIRCUITS AND INDUCTOR-CONVERTOR BRIDGE CIRCUITS FOR THE TRANSFER OF ENERGY BETWEEN SUPERCONDUCTING COILS

Robert L. Kustom 1979 6 p refs Presented at the Intern. Symp. on Superconductive Energy Storage, Osaka, 8-10 Oct. 1979

(Contract W-31-109-eng-38)

(CONF-791075-4) Avail: NTIS HC A02/MF A01

The design criteria for flying capacitor bridge circuits and inductor convertor bridge circuits were compared for similar energy transfer requirements. It is shown that the capacitive energy is proportional to the ratio of minimum commutation time versus energy transfer time. R.C.T.

N80-25547# Stanford Univ., Calif. Dept. of Materials Science and Engineering.

PHOTOELECTRONIC PROPERTIES OF ZINC PHOSPHIDE CRYSTALS, FILMS AND HETEROJUNCTIONS Quarterly Progress Report, 1 Oct. - 31 Dec. 1979

Richard H. Bube 31 Dec. 1979 15 p refs

(Contract EG-77-C-01-4042)

(SU-DSE-4042-T18; QPR-3) Avail: NTIS HC A02/MF A01

An increase in crystal growth rate for Zn3P2 was achieved by a vacuum baking step before crystal growth designed to reduce the pressure of excess gases in the ampoule. An analysis of the problem indicates that results are consistent with expectations. Samples have been submitted for mass spectroscopic evaluation and SIMS analysis. Construction of suitable equilibrium defect distribution diagrams for Zn3P2 was initiated. Good rectifying diodes were prepared by vacuum evaporation of Mg onto etched surfaces of Zn3P2. A barrier height of 0.75 eV was measured from C.V data in good agreement with the published value of 0.80EV. If the Zn3P2 surface was given a heat treatment in oxygen before Mg evaporation, the Mg made an ohmic contact indistinguishable from the normal treatment in hydrogen before Mg evaporation, good diode characteristics were observed, with strong forward current saturation above IV. DOE

N80-25548# Bendix Corp., Kansas City, Mo.

IMPROVING DELAMINATION RESISTANCE OF MULTILAYER PRINTED WIRING BOARDS

J. W. Lula Mar. 1980 19 p refs

(Contracts EY-76-C-04-0613; DE-AC04-76DP-00613)

(BDX-613-2413) Avail: NTIS HC A02/MF A01

The incorporation of black oxide innerlayer surface treatment prepreg conditioning into the manufacturing process for multilayer printed wiring boards (PWBs) is described. Both black oxide and red oxide innerlayer surface treatments show the capability to provide acceptable delamination resistance for multilayer PWBs made from FR-4 material. Optimum processing parameters for applying the oxide treatment are discussed. In order to manufacture a multilayer PWB that will withstand solder dipping/leveling as well as subsequent drag soldering, it is necessary to remove absorbed moisture from the prepeg before lamination. Data are presented on the rate of moisture removal from prepreg when dried and on the rate of moisture reabsorption when dried prepreg is exposed to 24% C/50% relative humidity environment. DOE

N80-25549# California Univ., Berkeley. Lawrence Berkeley Lab.

DESIGN AND APPLICATION OF A MEGA-MOMENT ELECTROMAGNETIC DIPOLE SOURCE

C. A. Riveros and N. E. Goldstein Oct. 1979 18 p refs Presented at the 49th Ann. Meeting and Exposition, Soc. of Exploration Geophysicists, New Orleans, 4-8 Nov. 1979 Prepared in cooperation with Chicago Univ., Ill.

(Contract W-7405-eng-48)

(LBL-9920; CONF-791107-2) Avail: NTIS HC A02/MF A01

An electromagnetic transmitter capable of generating a magnetic dipole moment in excess of one million mks over a wide frequency range was designed and field tested in connection with geothermal exploration surveys. Engineering aspects of the transmitter pertinent to the design and construction of similar

transmitters for various geophysical applications are dealt with. A prototype transmitter specifically suited to, but not requiring adjustments for, the reactive nature of the transmitter loop was designed. This prototype was built around an existing 60 kW motor generator set mounted on a one ton, 4 wheel drive truck, and was designed as the EM 60 controlled source. Field tests were carried out with a horizontal loop transmitter in both Grass Valley, Nevada and on the flanks of Mount Hood, Oregon. During these tests, the magnetic moment exceeded one million mks (rms) over the frequency range .02 to 500 Hz, although only 1.4 to 1.6 km of no. 6 welding cable was used. Field tests indicated the transmitter design provides a safe and reliable system. DOE

N80-25550# Sandia Labs., Albuquerque, N. Mex.
PERFORMANCE OF DIGITAL INTEGRATED CIRCUIT TECHNOLOGIES AT VERY HIGH TEMPERATURE
J. L. Prince, B. L. Draper, E. A. Rapp, J. N. Kronberg, and L. T. Fitch 1980 10 p refs Presented at Electronic Component Conf., San Francisco, 28 Apr. 1980
(Contract EY-76-C-04-0789; N66001-78-C-3022)
(SAND-79-2092C; CONF-800410-2) Avail: NTIS HC A02/MF A01

Results of investigations of the performance and reliability of digital bipolar and CMOS integrated circuits over the 25 to 340 C range are reported. Included in these results are both parametric variation information and analysis of the functional failure mechanisms. Although most of the work was done using commercially available circuits (TTL and CMOS) and test chips from commercially compatible processes, some results of experimental simulations of dielectrically isolated CMOS are also discussed. It was found that commercial Schottky clamped TTL and dielectrically isolated, low power Schottky-clamped TTL functioned to junction temperatures in excess of 325 C. Standard gold doped TTL functioned only to 250 C, while commercial, isolated L functioned to the range 250 C to 275 C. Commercial junction isolated CMOS buffered and unbuffered, functioned to the range 280 C to 310 C depending on the manufacturer. Experimental simulation of simple dielectrically isolated CMOS integrated circuits, fabricated with heavier doping levels than normal, functioned to temperatures in excess of 340 C. High temperature life testing of experimental silicone-encapsulated simple TTL and CMOS integrated circuits have shown no obvious life limiting problems to data. No barrier to reliable functionality of TTL bipolar or CMOS integrated circuits at temperatures in excess of 300 C was found. DOE

N80-25551# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
RADIATION EFFECTS ON ORGANIC INSULATORS FOR SUPERCONDUCTING MAGNETS Annual Progress Report, period ending 30 Sep. 1979
R. R. Coltman, Jr., C. E. Klabunde, R. H. Kernohan, and C. J. Long Nov. 1979 56 p refs
(ORNL/TM-7077) Avail: NTIS HC A04/MF A01

The most recent efforts in a program to study the effects of irradiation near 5 K on organic insulators for fusion reactors have extended the irradiation dose from 2 x 10 to the 9th power to 1 x 10 to the 10th power rads and have studied additional effects due to fast neutrons. When added to a gamma-ray dose of 2.4 x 10 to the 9th power rads, a fast-neutron fluence of 2.4 x 10 to the 20th power n/sq m has little effect upon changes in electrical and mechanical properties. At this dose, present results are in agreement with previous results. At a dose of 1 x 10 to the 10 power rads, particle-filled life in terms of mechanical strength, while fiberglass-cloth-filled epoxies retain sufficient strength for use. Electrical-resistivity and voltage-breakdown values were reduced in some materials but remained in a usable range. Two sheet-type materials showed excellent stability in their electrical properties. Dimensional stability was generally good, except for one epoxy which showed considerable swelling at the higher dose. DOE

N80-25552# Ames Lab., Iowa.
PHOTOACOUSTIC DETECTION METHODS FOR CHARACTERIZING LASER IRRADIATION AND RECRYSTALLIZATION OF SEMICONDUCTORS
J. F. McClelland and R. N. Kniseley 1979 7 p refs Presented at Symp. on Laser and Electron Processing of Mater., Cambridge, Mass., 27-30 Nov. 1979
(Contract W-7405-eng-82)
(ISM-262; CONF-791173-1) Avail: NTIS HC A02/MF A01

The use of photoacoustic detection is discussed as a technique for monitoring laser heating and for characterizing implantation of recrystallization of semiconductors via optical absorption. Preliminary results are reported for laser heating of Ge. A method is proposed for signal processing to enable measurement of optical absorption coefficient changes due to implantation and recrystallization without a background signal from the unimplanted region of the semiconductor. DOE

N80-25553# Massachusetts Inst. of Tech., Cambridge. High Voltage Research Lab.
PARTICLE-INITIATED BREAKDOWN IN GAS DIELECTRIC CABLE INSULATION EXPANDED SCOPE PROGRAM Final Report
Chathan M. Cooke Nov. 1979 122 p refs Sponsored by Elec. Power Res. Inst.
(Contracts EX-76-C-01-1556; E(49-18)-1566; EPRI Proj. 7802)
(EPRI-EL-1264) Avail: NTIS HC A06/MF A01

The adverse influence of conducting particle contaminants in gas insulated power apparatus was investigated in a series of experiments that employed coaxial configurations and dc voltages to 1500 kV. Both SF6 and N2 gases at pressures from 1 to 14.6 atm absolute were used. The particles were intentionally introduced and ranged from 1.6 to 6.4 mm spheres and wires. Insulation failures due to the induced electric stress were examined along the surfaces of solid insulators and in the gas gap. Visual observations, photographs, and electrical measurements helped in distinguishing various processes. Particles could reduce the insulation performance by factors of 3 to 5 and were especially significant when moved to the center conductor. A comparison between dc and ac performance was made. The dc breakdown values exhibited wider scatter, though their lower limit was similar to that found under ac. Overall fundamental forces, and processes which involve particle contamination effects were identified and found to be the same for dc and ac voltage stresses. DOE

N80-25554# Ames Lab., Iowa.
SUPERCONDUCTIVITY IN THE LANTHANUM-YTTRIUM-MANGANESE ALLOY SYSTEM
Roger Joseph Stierman Mar. 1980 37 p refs
(Contract W-7405-eng-82)
(IS-T-895) Avail: NTIS HC A03/MF A01

An empirical approach involving lattice instabilities was investigated in the search for new superconducting materials. Pseudo-lanthanide compounds using La and Y were prepared for the system La/sub 1-x/Y/sub x/Mn2 by arc melting and subsequent heat treatment. Low temperature magnetic susceptibility and low temperature heat capacity measurements were made. The unit cell lattice parameters were determined from X-ray powder patterns taken on most samples and metallographic examination was carried out on selected samples. Alloys with low La concentrations (x equal to or greater than 0.6) showed RMn2 in the cubic C15 Laves phase as the major component with second phase material present. The magnetic susceptibility and X-ray data indicated a superconducting phase which seemed to be the RMn2 phase, but heat capacity measurements showed the second phase material was the superconductor, while the RMn2 was not. Failure to form compounds with higher La content was experienced and may be due to the lattice instability expected at x = 0.56. DOE

N80-25555# National Technical Information Service, Springfield, Va.
ELECTRON BEAM SEMICONDUCTOR DEVICES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Feb. 1980
William E. Reed Mar. 1980 79 p Supersedes NTIS/PS-79/0142; NTIS/PS-78/0174; NTIS/PS-77/0158
(PB80-805997; NTIS/PS-79/0142; NTIS/PS-78/0174; NTIS/PS-77/0158) Avail: NTIS HC $30.00/MF $30.00 CSCL 09A

Federally-sponsored research reports are cited, covering the design, development, fabrication, and applications of electron beam

semiconductor devices. Applications include amplifiers, pulse generators, image tubes, switches, and electron beam memory devices. This updated bibliography contains 72 abstracts, 5 of which are new entries to the previous edition. GRA

N80-25556# National Technical Information Service, Springfield, Va.
ELECTRON BEAM SEMICONDUCTOR DEVICES. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Feb. 1980
William E. Reed Mar. 1980 97 p Supersedes NTIS/PS-79/0145; NTIS/PS-78/0175; NTIS/PS-77/0159
(PB80-806003; NTIS/PS-79/0145; NTIS/PS-78/0175; NTIS/PS-77/0159) Avail: NTIS HC $30.00/MF $30.00 CSCL 09A

The bibliography cites worldwide research on the design, development, fabrication, performance, and applications of electron beam semiconductor devices. Applications include amplifiers, image tubes, memory devices, pulse generators, and electron beam pumped semiconductor lasers. This updated bibliography contains 90 abstracts, 9 of which are new entries to the previous edition. GRA

N80-25557# National Technical Information Service, Springfield, Va.
SCHOTTKY BARRIER DEVICES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - 1979
William E. Reed Feb. 1980 201 p Supersedes NTIS/PS-79/0045; NTIS/PS-78/0073 and NTIS/PS-77/0089
(PB80-804776; NTIS/PS-79/0045; NTIS/PS-78/0073; NTIS/PS-77/0089) Avail: NTIS HC $30.00/MF $30.00 CSCL 09A

Federally-sponsored research reports are cited on the development, fabrication, performance, and applications of Schottky barrier devices. Research on the physics of Schottky barriers is included. Applications cover solar cells, photodiodes, mixers, transistors, signal processors, and infrared devices. This updated bibliography contains 294 abstracts, 25 of which are new entries to the previous edition. GRA

N80-25558# National Technical Information Service, Springfield, Va.
SCHOTTKY BARRIER DEVICES, VOLUME 4. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report for 1978
William E. Reed Feb. 1980 202 p
(PB80-804784) Avail: NTIS HC $30.00/MF $30.00 CSCL 09A

An abstracted bibliography containing 195 citations of research on the development, fabrication, performance, and application of Schottky barrier devices is presented. Topics include the physics of Schottky barriers, microwave equipment, logic devices, field effect transistors, photodiodes, resistively loaded antenna, semiconductors, acoustic correlators, and solar cells. GRA

N80-25559# National Technical Information Service, Springfield, Va.
SCHOTTKY BARRIER DEVICES, VOLUME 5. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report for 1979
William E. Reed Feb. 1980 177 p Supersedes NTIS/PS-79/0047; NTIS/PS-78/0075; NTIS/PS-77/0091
(PB80-804792; NTIS/PS-79/0047; NTIS/PS-78/0075; NTIS/PS-77/0091) Avail: NTIS HC $30.00/MF $30.00 CSCL 09A

A bibliography containing 170 abstracts of worldwide research on the development, fabrication, performance and applications of Schottky barrier devices is presented. Research on the physics of Schottky barriers is included. Applications cover microwave equipment, logic devices, field effect transistors, photodiodes, surface acoustic wave devices, and solar cells. GRA

N80-25560# National Technical Information Service, Springfield, Va.
SWITCHING CIRCUITS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, Feb. 1977 - Feb. 1980
Mar. 1980 208 p Supersedes NTIS/PS-79/0192; NTIS/PS-78/0218 and NTIS/PS-77/0106
(PB80-805880; NTIS/PS-79/0192; NTIS/PS-78/0218; NTIS/PS-77/0106) Avail: NTIS HC $30.00/MF $30.00 CSCL 09E

The bibliography cites 201 Federally-funded research reports on the theory and applications of switching circuits. Studies on production engineering measures logic design, microelectronics, and system reliability are included. GRA

N80-25561# National Technical Information Service, Springfield, Va.
SWITCHING CIRCUITS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1972 - Feb. 1980
William E. Reed Mar. 1980 239 p Supersedes NTIS/PS-79/0193; NTIS/PS-78/0219; NTIS/PS-77/0107
(PB80-805898; NTIS/PS-79/0193; NTIS/PS-78/0219; NTIS/PS-77/0107) Avail: NTIS HC $30.00/MF $30.00 CSCL 09E

The bibliography cites 232 abstracts on worldwide research on the theory and applications of switching circuits. Studies on logic design, performance features, and computerized simulation are included. GRA

N80-25562# National Technical Information Service, Springfield, Va.
HYBRID MICROELECTRONIC CIRCUITS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Feb. 1980
William E. Reed Mar. 1980 138 p Supersedes NTIS/PS-79/0210; NTIS/PS-78/0211 and NTIS/PS-77/0220
(PB80-805922; NTIS/PS-79/0210; NTIS/PS-78/0211; NTIS/PS-77/0220) Avail: NTIS HC $30.00/MF $30.00 CSCL 09E

The bibliography presents 131 Federally sponsored research reports relating to the technology of thick and thin film hybrid microcircuits. Research on the design, materials, processing, fabrication, quality control, reliability, and applications of the circuits is included. GRA

N80-25563# National Technical Information Service, Springfield, Va.
HYBRID MICROELECTRONIC CIRCUITS, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - Feb. 1980
William E. Reed Mar. 1980 276 p Supersedes NTIS/PS-79/0212; NTIS/PS-78/0212; NTIS/PS-77/0222
(PB80-805930; NTIS/PS-79/0212; NTIS/PS-78/0212; NTIS/PS-77/0222) Avail: NTIS HC $30.00/MF $30.00 CSCL 09E

Research reports from worldwide literature relating to the technology of thick and thin film hybrid microcircuits are cited. Research on the design, materials, processing, fabrication, quality control, reliability, and applications of the circuits is included. This updated bibliography contains 269 abstracts, 130 of which are new entries to the previous edition. GRA

N80-25564# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: ACCURATE LINEWIDTH MEASUREMENTS ON INTEGRATED-CIRCUIT PHOTOMASKS Final Reprot
John M. Jerke, ed. Feb. 1980 171 p refs Sponsored in part by DARPA
(PB80-148216; NBS-SP-400-43; LC-79-600191) Avail: NTIS HC A08/MF A01 CSCL 13H

The progress of the NBS program to develop improved theory for accurate linewidth measurements with optical microscopes, to develop primary linewidth calibration of 1 to 10 micrometer wide lines on integrated-circuit (IC) photomasks, and to provide calibrated measurement artifacts and measurement procedures to the IC industry is discussed. GRA

N80-25565# RCA Labs., Princeton, N. J. Integrated Circuit Lab.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: COMPREHENSIVE TEST PATTERN AND APPROACH FOR

CHARACTERIZING SOS TECHNOLOGY Final Report
W. E. Ham Jan. 1980 370 p refs
(Contract NBS-5-35916; ARPA Order 2397)
(PB80-147952; NBS-SP-400-56; LC-79-600194) Avail: NTIS HC A15/MF A01 CSCL 09E

Detailed information is presented concerning a comprehensive approach to parametric process characterization for IC processes. This includes defining the general areas of importance, devising structures which are sensitive to these areas, devising methods for testing the structures, documenting the structures, tests, and results producing suitable data reduction and presentation schemes, and considering the implementation of the methods in a practical sense. Proper methods for automatically testing some of these structures are explored. Seven divisions were created for the general types of test structure: (1) individual structures of nominal dimensions; (2) closely spaced identical structures; (3) structures of various sizes; (4) series and parallel combinations of structures; (5) structures especially sensitive to lithographic properties; (6) basic circuit building blocks; and (7) small area test circuits. GRA

N80-25568# National Technical Information Service, Springfield, Va.
TRANSISTOR AMPLIFIERS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, Jul. 1977 - Feb. 1980
William E. Reed Mar. 1980 206 p Supersedes NTIS/PS-79/0196; NTIS/PS-78/0225; NTIS/PS-77/0202
(PB80-808037; NTIS/PS-79/0196; NTIS/PS-78/0225; NTIS/PS-77/0202) Avail: NTIS HC $30.00/MF $30.00 CSCL 09A

The design, development, and applications of transistor amplifiers are covered in the cited reports. Research on reliability and radiation effects is included. This updated bibliography contains 99 abstracts, 23 of which are new entries to the previous edition. GRA

N80-26258# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
RESEARCH OF AN OPTIMAL CONFIGURATION FOR HIGH STABILITY QUARTZ OSCILLATORS ON BOARD AIRCRAFT AND MISSILES
Jacques Beaussier *In its* La Rech. Aerospatiale, Bimonthly Bull. no. 1979-6 (ESA-TT-632) 1979 p 39-53 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 375-386 Original report in FRENCH previously announced as A80-19990 Sponsored in part by DRET (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N80-25567 Brown Univ., Providence, R. I.
AN APPROXIMATION AND AN ASSOCIATED NUMERICAL METHOD FOR TWO-DIMENSIONAL STEADY SUPERSONIC GAS DYNAMICS Ph.D. Thesis
Timothy Scott Lewis 1979 63 p
Avail: Univ. Microfilms Order No. 8007033

Approximate and exact methods are developed for computing everywhere supersonic two dimensional steady flow in which shock waves are present. In particular, the problem of flow over an airfoil with attached shocks at the leading and trailing edges is considered. In the classical simple wave approximation, the entropy and one of the Reimann invariants are taken to be constant. While both are in fact constant up to third order in the shock strength, the variation in the Reimann invariant is numerically smaller, by an order of magnitude for many cases of interest. Approximations incorporating variable entropy but assuming the Reimann invariant is constant everywhere or constant along streamlines are developed. The latter approximation can be considered an extension of shock expansion theory. The governing equations are transformed to coordinates consisting of the streamlines and one family of characteristics. In the simpler approximation, in which the Reimann invariant is taken to be constant everywhere, the solution in characteristic coordinates is explicit. Dissert. Abstr.

N80-25568 Brown Univ., Providence, R. I.
TWO NUMERICAL METHODS FOR STEADY STRATIFIED SHEAR FLOWS OVER AN OBSTACLE Ph.D. Thesis
William Kingsley Stevens 1979 81 p
Avail: Univ. Microfilms Order No. 8007071

The nonlinear problem of the steady flow of a stratified fluid of finite depth over an obstacle is investigated. The effects of viscosity are neglected and the pressure field is assumed to be hydrostatic. A numerical procedure for two dimensional flows is introduced which permits the calculation of all possible steady, continuous flow fields with or without closed streamlines for any given upstream velocity and entropy (or density for incompressible flow) profiles. The major contribution of this investigation consists in the treatment of flows with closed streamlines. It is found that a general feature of small Froude number flows with significant variation in entropy (or density) is the occurrence of stagnation points within the flow field. The streamline passing through such a point is allowed to split resulting in a flow field with closed streamlines. The portion of the field within the closed streamline corresponds to a region of recirculating or vortex flow. Constants of motion along streamlines are used to construct the boundaries of these regions. Calculations are carried out for upstream data obtained from actual measurements in the Rocky Mountains and comparison is made between the solutions corresponding to the compressible and incompressible models. Dissert. Abstr.

N80-25569 State Univ. of New York at Buffalo.
THE MEASUREMENT OF TURBULENCE WITH THE BURST-TYPE LASER DOPPLER ANEMOMETER: ERRORS AND CORRECTION METHODS Ph.D. Thesis
Preben Buchhave 1979 152 p
Avail: Univ. Microfilms Order No. 8005643

The functioning of the laser anemometer in the burst mode was investigated and sources of errors in the velocity determination were analyzed and measured. The residence time analysis of burst type (LDA) signals was developed to encompass spectral measurements as well as moments of the velocity distribution. It is shown both analytically and experimentally that the complete time statistics of the velocity field can be recovered from the random burst signal if the particle residence time is measured along with its velocity. Formulas for mean and mean square velocity, autocorrelation function and spectra were derived, and the difference in the results obtained by various data processing methods predicted from the theory were substantiated by measurements. The system is based on an LDA-counter processor coupled to a minicomputer through a special parallel interface with a buffer memory to absorb data arriving at random times. Results of the LDA data processing were compared to simultaneous measurements with conventional techniques.
Dissert. Abstr.

N80-25570 Drexel Univ., Philadelphia, Pa.
NUMERICAL COMPUTATIONS OF FRICTION AND HEAT TRANSFER IN FREE SWIRLING PIPE FLOW Ph.D. Thesis
Frank C. Huang 1980 157 p
Avail: Univ. Microfilms Order No. 8011409

Elliptic equations governing flows and heat transfer for a laminar free swirling pipe flow (Re = 100, Pr = 0.7) and a turbulent free swirling pipe flow (Re = 49100, Pr = 0.7) were solved numerically. The flows under consideration are axisymmetric which were produced by an initial swirl promoter. A computer program with an effective iteration process was developed to solve the elliptic equations based on an existing upwind-difference scheme. In the laminar free swirling flow case, 17 unequally spaced grid points were selected in the axial direction and 21 equally spaced grid points were assigned in the radial direction. In the case of the turbulent flow, a total of 17 x 31 grid points were used in the flow field; and both axial and radial directions are unequally spaced. An extra fine grids

distribution was given in the radial direction for the near wall region to accommodate large physical properties change of this region. This method of treatment was found to be very effective. In addition to the calculated flow and temperature field, friction factors and Nusselt numbers were also computed to give the information on heat transfer augmentation. The results based on constant pumping power, indicate an increase in average Nusselt number over the fully developed value without swirl by 100% for laminar flow and 37% for turbulent flow at a location nine diameter from the inlet. The calculated results were compared with previous calculations and available data. They are in good agreement with the same intensity of the initial vortex promoter. Dissert. Abstr.

N80-25571 Minnesota Univ., Minneapolis.
HEAT TRANSFER TO STAGGERED ARRAYS OF IMPINGING CIRCULAR AIR JETS Ph.D. Thesis
Alireza Irani Behbahani 1979 148 p
Avail: Univ. Microfilms Order No. 8011764

Local heat transfer due to impinging arrays of staggered circular air jets on a flat plate is studied experimentally. Two different arrangements of multiple jets, of spacings S/D = 4 and 8 (where S is the jet spacing and D is the jet diameter) are employed. The parameters that were varied include jet orifice plate to impingement surface spacing, Y/D (Y/D from 2 to 5) and jet Reynolds number Re sub j (Re sub j from 5000 to 1500). Heat transfer coefficients are determined from the measured wall temperature and presented in the form of a Nusselt number. The driving force for heat transfer is defined as the temperature difference between the wall and the adiabatic wall temperature. At low jet exit velocity, the adiabatic wall temperature is approximately equal to the jet total temperature. Local Nusselt numbers are integrated to produce spanwise, spanwise-streamwise, and area averaged Nusselt numbers. The local Nusselt number shows a periodic variation with streamwise as well as spanwise directions, with high values occuring at stagnation regions. Stagnation Nusselt numbers are moved further in the downstream direction as the amount of cross-flow due to upstream jet air increases. A trend of decreasing heat transfer is observed around the last two rows of jets in the streamwise direction. Dissert. Abstr.

N80-25572 Minnesota Univ., Minneapolis.
A COORDINATE TRANSFORMATION METHOD FOR SOLVING A CONVECTION PHASE CHANGE PROBLEM Ph.D. Thesis
Lawrence Malm Hossfeld 1979 274 p
Avail: Univ. Microfilms Order No. 8011822

A computational method is presented for solving certain types of problems involving pure conduction or natural convection heat transfer in two dimensions in which a portion of the domain boundary is irregular and/or moving with respect to a fixed Cartesian coordinate system. The method is developed specifically for a problem involving axisymmetric melting of a solid around a vertical heating tube in a container of a finite height. The solid is initially at the melting temperature; thus heat transfer occurs only in the melted liquid. Equal liquid and solid densities are assumed, and the outer wall is assumed to be beyond the extent of the liquid region. Dissert. Abstr.

N80-25573 Houston Univ., Tex.
NATURAL CONVECTIVE HEAT TRANSFER IN TRAPEZOIDAL ENCLOSURES Ph.D. Thesis
Levent Muammer Iycan 1979 268 p
Avail: Univ. Microfilms Order No. 8012529

Natural convection in trapezoidal enclosures was investigated experimentally and analytically. Experimental heat transfer data were obtained on air confined in a test box with trapezoidal grooves, which was placed into a pressure vessel. Each groove had a water cooled top plate, an electrically heated bottom plate and two sidewalls. Two limiting cases of sidewall conditions were considered: highly conductive and highly insulative sidewalls. The experimental data was expressed as pious of Nusselt number versus Rayleigh number for various inclination angles. The experimental range of parameters covers Rayleigh numbers from 3000 to 4x10 to the 7th power and inclination angles from 0 to 180 degrees. A two dimensional analytical model was developed for the first two regimes of the natural convection motion: the conduction regime and the unicellular convection regime. The governing partial differential equations were solved by the Galerkin method and the resulting stream pattern, velocity components, temperature profiles and Nusselt numbers were given. Dissert. Abstr.

N80-25574 Texas A&M Univ., College Station.
FINITE ELEMENT ANALYSIS OF LAMINAR CONVECTIVE HEAT TRANSFER Ph.D. Thesis
Jesse Louis Holster 1979 215 p
Avail: Univ. Microfilms Order No. 8011956

A finite element method is developed for the analysis of two dimensional transient laminar convective heat transfer. The method is applied to three classes of problems over a range of flow and thermal conditions. The results of eight example problems are compared with other numerical solutions, existing experimental data, and experimental data collected by the author. The governing equations on continuity momentum, and energy are developed in dimensionless form after employing the Boussinesq approximation to the fluid medium. Pressure is eliminated as a variable by casting the dimensionless equations into a vorticity stream function temperature formulation. The finite element method chosen for the solution of this set of equations involves their formulation in variational form as functionals to be minimized. The time derivatives and convective terms in the vorticity and energy equation are treated as invariants over a small time interval. An implicit time stepping scheme is used to integrate forward with time from the initial conditions. Dissert. Abstr.

N80-25575 Oklahoma State Univ., Stillwater.
INCOMPRESSIBLE FLUID FLOW IN COLLAPSIBLE TUBES Ph.D. Thesis
David Lee Smith 1979 119 p
Avail: Univ. Microfilms Order No. 8013050

The problem of predicting fluid flow variables in a highly flexible tube which is collapsed by excessive external pressure was studied to measure and predict the steady-state flowrate versus pressure drop relationship for a collapsible tube. A significant improvement in agreement between predicted and measured upstream pressure is demonstrated over previous modelling attempts. This improvement is attributed to an analysis which was formulated solely from first physical principles. The effect of axial tube prestrain on the fluid pressure-flowrate data is demonstrated experimentally and analytically. Experimental data is presented which shows the onset of tube/fluid oscillation and its location in the pressure drop-flowrate relationship. The measured axial distribution of interior fluid wall pressure is presented with photographs of the corresponding exterior tube shape. Dissert. Abstr.

N80-25576 Iowa State Univ. of Science and Technology, Ames.
BOILING HEAT TRANSFER AND CRITICAL HEAT FLUX IN HELICAL COILS Ph.D. Thesis
Michael Keith Jensen 1980 292 p
Avail: Univ. Microfilms Order No. 8012969

The present study was initiated to obtain more information on boiling heat transfer in coils, with particular emphasis on the effect of an outside heat flux tilt on the CHF. An experimental investigation was conducted to determine the boiling heat transfer characteristics of R-113 in electrically heated, helically coiled tubes and in straight tubes (for reference). An experimental test loop was designed and constructed for this study. Electrically heated coils of three different ratios of tube diameter to coil diameter (d/D = 0.0182, 0.0353, and 0.0649) were tested using R-112 at a pressure of 0.94 MPa and with wide ranges of mass velocity, exit sub cooling quality, and flux tilt toward the outside of the coil. A straight, horizontal tube was tested for reference. Subcooled CHF is degraded in coils relative to straight, horizontal tubes. Degradation increases with increasing d/D and mass velocity. Quality CHF is enhanced and increases with increasing d/D; CHF initially increases with increasing mass velocity but begins to decrease after a maximum is reached. The degrading effect of buoyancy on CHF in straight, horizontal tubes and in coils is shown. A Forbidden Zone is described in which severe operational problems can occur if the heat exchanger is operating with low subcooling or low quality near the inlet and high quality near the exit. Dissert. Abstr

N80-25577 Mississippi State Univ., State College.
NUMERICAL SOLUTION OF THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS ABOUT A THREE-DIMENSIONAL BODY USING BOUNDARY-FITTED COORDINATES Ph.D. Thesis
Tien Hua Fu 1979 179 p
Avail: Univ. Microfilms Order No. 8011480

Numerical solution of the three dimensional incompressible time dependent Navier-Stokes equations for laminar flow about a sphere is investigated. The numerical generated boundary fitted coordinate system is used in order to generate coordinate surfaces coincident with the boundary contours in the physical space. The Navier-Stokes equations are formulated in primitive variables. The pressure Poisson equation is obtained by the divergence operation on the momentum equations. Not all the terms are retained in the pressure equation. Boundary conditions imposed on the body surface are the no-slip and normal derivative of pressure. The constant free stream and constant pressure are used at infinity. Two methods (one and two step) are used to solve the Navier-Stokes equations. The one step method is the direct discretitation of the momentum and pressure equations. The two step method is formulated by splitting the momentum equation with an intermediate time step n + 1/2. The calculation is performed in two iteration steps. The comparisons are given at low and high Reynold's number flow conditions.
Dissert. Abstr.

N80-25578 Virginia Polytechnic Inst. and State Univ., Blacksburg.
NEAR-WALL SIMILARITY IN TWO- AND THREE-DIMENSIONAL TURBULENT BOUNDARY LAYERS Ph.D. Thesis
John Elias McAllister, Jr. 1979 785 p
Avail: Univ. Microfilms Order No. 8013268

Static pressure, mean velocity, indirect wall shear from Preston tubes, direct wall shear using a two dimensional (single line of action) floating element device, and direct wall shear measurements from an omnidirectional floating element capable of simultaneously determining magnitude and direction of a wall shear vector were completed over a modest range of two dimensional (near zero) pressure gradient flows. State pressure, mean velocity, and direct wall shear measurements using the omnidirectional meter were completed in a pressure driven, and two different shear driven three dimensional flows. These data were combined to evaluate ten of eleven three dimensional similarity models found in the literature. Uncertainty estimates on all the data are presented. Two dimensional experimental results show that the constants in the two dimensional law of the wall formula appear to be slightly dependent on Reynolds number, and the Patel calibration formulas for Preston tubes to be better than any other available formulas. Dissert. Abstr.

N80-25579 Stanford Univ., Calif.
POROUS MEDIA FLOW PROBLEMS: NATURAL CONVECTION AND NON-NEWTONIAN Ph.D. Thesis
Kenneth Lee Walker 1980 120 p
Avail: Univ. Microfilms Order No. 8011723

Natural convection of a Newtonian fluid and one dimensional flow of a nonNewtonian fluid are studied. Convection in a rectangular porous cavity driven by heating in the horizontal is analyzed by a number of different techniques which yield a fairly complete description of the two dimensional solutions. The solutions are governed by two dimensionless parameters: the Darcy-Rayleigh number R and cavity aspect ratio A. The flow behavior of a dilute solution of polyacrylamide in corn syrup flowing through porous media is also studied. Measurement of the pressure drop and flow rate are made for the solution flowing through a packed bed of glass beads. At low velocities the pressure drop as a function of velocity is the same as that for a Newtonian fluid of equal viscosity. At high flow rates the nonNewtonian fluid exhibited significantly higher pressure drops than a Newtonian fluid. Careful rheological measurements of the fluid are made using a Weissenberg rheogoniometer. From measurements of the dynamic viscosity shear it is determined that elastic effects are negligible. It is believed that the increased pressure gradients are caused by nonlinear viscous effects resulting from the extensional components of the flow.
Dissert. Abstr.

N80-25580 Washington Univ., Seattle.
NUMERICAL MODELING WITH A MOVING COORDINATE SYSTEM: APPLICATION TO FLOW THROUGH POROUS MEDIA Ph.D. Thesis
Ole Krough Jensen 1980 297 p
Avail: Univ. Microfilms Order No. 8013538

A numerical technique for solving convective diffusive equations is developed. Convective diffusive equations arise from mass conservation relations in flow through porous media. An analysis and comparison of numerical methods are performed. Criteria are given for the spatial mesh size to eliminate the oscillations for weighted residual methods. The solution technique developed minimizes the oscillations. The differential equations are transformed into a moving coordinate system with a time dependent velocity, which eliminates the influence of the convective term, but makes the boundary location change in time. Both linear and nonlinear, one and two dimensional equations are solved with physically realistic parameters. Methods for determining the moving coordinate system velocity and changing the location of the boundary conditions are described. Orthogonal collocation on finite elements, finite difference, and the Galerkin finite element method are applied. Several integration schemes including variable timestep schemes are used. Comparisons of the accuracy and the solution cost to exact solutions and schemes with a fixed coordinate system are made. Dissert. Abstr.

N80-25581 Washington Univ., Seattle.
A PHOTOGRAPHIC STUDY OF DROP FORMATION HEAT AND MASS TRANSFER Ph.D. Thesis
Paul Aubrey Klett 1979 376 p
Avail: Univ. Microfilms Order No. 8013548

The basis of a refined version of the photographic technique as applied to drop formation heat and mass transfer is discussed. Volume changes which are determined from diffusely backlighted forming drops are used to calculate instantaneous heat or mass transfer. Direct shadowgraphs are given and are used to interpret drop formation phenomena. Observations of growth characteristics of forming drops are reported, along with both mass transfer and heat transfer coefficients. Some of the forces acting on forming drops are inferred from the effects of heat transfer, and a possible synergism between simultaneous heat and mass transfer is recorded. Dissert. Abstr.

N80-25582 California Inst. of Tech., Pasadena.
MOTION OF A SPHERE IN THE PRESENCE OF A PLANE INTERFACE, 1. MODELING OF NON-ISOTHERMAL TURBULENT FLOWS, 2 Ph.D. Thesis
Seong Hee Lee 1980 257 p
Avail: Univ. Microfilms Order No. 8012209

The motion of a sphere in the presence of a fluid/fluid interface is studied. A solution is derived for a point force near a plane interface. Then the solution is extended to include the higher-order terms which are required to describe the motion of a solid sphere. Singularities of higher orders at the center of the sphere are obtained by using the method of reflections. This method yields asymptotic solutions for the general motion of a sphere in the presence of an interface. The second-order, mean Reynolds stress turbulence closure approximation is extended to nonisothermal turbulent flows with negligible buoyancy. The method of invariant modeling is used to systematically model the various higher order moments in the governing equations. This approach yields a general form for each unknown correlation in the transport equations of u sub i theta, theta squared and epsilon sub theta each containing many terms with parameters that must be determined from experimental data. For practical application, it is necessary to reduce the number of terms. The most important terms are filtered from the general model for each unknown moment and their parameters are evaluated based on experimental data. Dissert. Abstr.

N80-25583 Iowa Univ., Iowa City.
DEVELOPMENT OF THE FINITE-DIFFERENTIAL NUMERICAL METHOD AND ITS APPLICATION IN TWO-DIMENSIONAL NAVIER-STOKES EQUATIONS Ph.D. Thesis
Hamid Naseri-Neshat 1979 287 p
Avail: Univ. Microfilms Order No. 8012400

A numerical scheme called finite differential method is used

to solve the two dimensional Navier-Stokes equation. The basic idea of the finite differential method is the incorporation of local analytic solutions in the numerical solutions of linear, or nonlinear partial differential equations. In the finite differential method, the flow region is subdivided into a number of small rectangular subregions, in which the Navier-Stokes equation is linearized, so that analytic solutions are obtained. The local finite differential analytical solutions for these subregions are then overlapped to cover the entire flow region. The assembly of these local analytical solutions, which still preserve the overall nonlinearity of the Navier-Stokes equation, results in a system of linear algebraic equations which are solved iteratively to provide the numerical solution of the total problem for the flow domain. Dissert. Abstr.

N80-25584 Tennessee Univ., Knoxville.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF FLOW BETWEEN A SMOOTH STATIONARY DISC AND A GROOVED ROTATING DISC Ph.D. Thesis
Jack Rutherford Missimer 1979 167 p
Avail: Univ. Microfilms Order No. 8012479

The radial outflow between a smooth or grooved rotating disc and a smooth stationary disc was examined both analytically and experimentally with the main interest on flow rate drag moment and heat transfer. All investigations were conducted for a zero pressure differential across the disc. The analysis was based on an integral method with an area averaged boundary condition on the grooved rotor. A finite difference scheme was employed in the radial direction and the zero pressure differential across the disc was satisfied by an iterative solution technique. Two fluids, air and SAE 10 motor oil, were examined to determine the applicability of the nondimensional variables used in the analysis. A region near Re sub s = 670, where the Reynolds number is based on the gap spacing, was found where flow transition from laminar to turbulent flow is believed to occur in the flow between the stator and rotor. Additionally a region was found near Re sub w = 2000, Reynolds number is based on the groove width, where flow transition form laminar to laminar to turbulent flow is believed to occur in the grooves.
Dissert. Abstr.

N80-25585 Rutgers - The State Univ., New Brunswick, N. J.
DROPLET DRAG AND BREAKUP IN SHOCK-WAVE INDUCED UNSTEADY FLOWS Ph.D. Thesis
Harendra Kumar Mehta 1980 22 p
Avail: Univ. Microfilms Order No. 8013173

The drag experienced by small, spherical water droplets in unsteady flow fields was investigated experimentally in order to create unsteady flow fields, a shock tube having a conical driver section was used which produced N-Waves. The convective flows resulting from the passage of waves had maximum initial velocities in the range 253 to 1009 cm/sec corresponding to leading shock strengths in the range of 0.01 to 0.04. These shock waves provided test times of about 7 milliseconds. A droplet generator produced controlled streams of droplets such that the droplet diameters ranged from 115 to 187 microns. Since the combination of droplet diameters and shock strengths resulted in Weber numbers less than 0.15, the droplets were treated as spheres. Experiments were carried out to study droplet breakup in suddenly imposed flows. Side and front view pictures of deforming droplets leading to bag-mode and umbrella-mode of breakup were obtained. Both modes of breakup are discussed in detail. Transition from bag-mode to umbrella-mode was found to take place in the Weber number range 7.1 < We < 7.8. Dissert. Abstr.

N80-25586*# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Science.
FEASIBILITY STUDIES FOR LIGHT SCATTERING EXPERIMENTS TO DETERMINE THE VELOCITY RELAXATION OF SMALL PARTICLES IN A FLUID Final Report, Jan. 1979 - May 1980
Charles Acquista and Lorenzo M. Narducci May 1980 18 p refs
(Grant NsG-2357)
(NASA-CR-163214) Avail: NTIS HC A02/MF A01 CSCL 20D

An approach for measuring the non-Markoffian component in the relaxation mechanism of a Brownian particle is proposed which combines desirable features of both the shock wave experiment and conventional light scattering experiments. It is suggested that the radiation pressure generated by a C.W. laser be used to guide an individual spherical particle to terminal velocity. At an appropriate time, the beam intensity is suddenly lowered to a value at which the radiation pressure is negligible, and the ensuing velocity relaxation is measured directly. A.R.H.

N80-25587# Weapons Systems Research Lab., Adelaide (Australia).
USE OF A NEW ANALYTICAL TECHNIQUE TO DETERMINE HEAT INPUT FROM INNER SURFACE TEMPERATURES MEASURED ON A HEMISPHERICAL SHELL DURING A FREE FLIGHT EXPERIMENT
G. Jepps Jan. 1979 64 p refs
(WSRL-0069-TR; AR-001-461) Avail: NTIS HC A04/MF A01

A technique for deriving outer surface temperature and heat transfer distributions from inner surface temperature measurements recorded from three arrays of thermocouples was investigated. A hemispherical shell which was mounted on the front of a rocket vehicle reached a maximum Mach number of 5.5 at 4 km altitude after 7 s of flight. It is concluded that the technique is successful but that the circumferential temperature and heat transfer resolutions could be improved by increasing the number of thermocouples in each array from seven to at least nine. R.C.T.

N80-25588*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROCEEDINGS OF THE AERO-OPTICS SYMPOSIUM ON ELECTROMAGNETIC WAVE PROPAGATION FROM AIRCRAFT
Apr. 1980 666 p refs Symp. held at Moffett Field, Calif., 14-15 Aug. 1979 Sponsored in part by AFWL
(NASA-CP-2121; A-8090) Avail: NTIS HC A99/MF A01 CSCL 20D

Wind-tunnel and flight experiments concerning natural and induced turbulence around an airplane and the effects on propagation characteristics of an emitter mounted in the airplane are described. Some of the papers are concerned with phase distortion of the propagating radiation, and others deal with mechanical jitter of the optical elements when exposed to open-cavity turbulence. The results include both aerodynamic and optical measurements and a consideration of the relationship between the two. Primary emphasis is on the dynamic disturbances, but theoretical and experimental evaluations of steady-state distortions are also presented. For individual titles, see N80-25589 through N80-25612.

N80-25589*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TURBULENT TWO-DIMENSIONAL JET FLOW AND ITS EFFECT ON LASER BEAM DEGRADATION
G. D. Catalano, G. F. Cudahy, James T. VanKuren (AFWL, Kirtland AFB, N. Mex.), and H. E. Wright *In its* Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 1-33 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

An experiment in which visible wavelength lasers traversed a well-documented two dimensional jet was conducted. Temperature perturbations varied from 0.25 to 1.80 K and velocity fluctuations ranged from 9.2 to 30.8 m/sec. Measured central spot intensities were as low as 18% of the undisturbed beam, depending on jet Mach number, beam position theory and experiment was two percent in terms of far field intensity. To supplement the flow field information, a laser Doppler velocimeter was developed to measure both mean and fluctuating velocities and a photo correlator was used as a signal processor. R.E.S.

N80-25590*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OVERVIEW OF 6- X 6-FOOT WIND TUNNEL AERO-OPTICS TESTS
Donald A. Buell *In its* Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 35-90 refs (For primary document see N80-25588 16-34)

Avail: NTIS HC A99/MF A01 CSCL 20D

The splitter-plate arrangement used in tests in the 6 x 6 foot wind tunnel and how it was configured to study boundary layers, both heated and unheated, shear layers over a cavity, separated flows behind spoilers, accelerated flows around a turret, and a turret wake are described. The flows are characterized by examples of the steady-state pressure and of velocity profiles through the various types of flow layers. R.E.S.

N80-25591*# Raman Aeronautics Research and Engineering, Inc., Palo Alto, Calif.

PRESSURE AND TEMPERATURE FIELDS ASSOCIATED WITH AERO-OPTICS TESTS

K. R. Raman *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 91-121 ref (For primary document see N80-25588 16-34)

(Contract NAS2-9920)

Avail: NTIS HC A99/MF A01 CSCL 20D

The experimental investigation carried out in a 6 x 6 ft wind tunnel on four model configurations in the aero-optics series of tests are described. The data obtained on the random pressures (static and total pressures) and total temperatures are presented. In addition, the data for static pressure fluctuations on the Coelostat turret model are presented. The measurements indicate that the random pressures and temperature are negligible compared to their own mean (or steady state) values for the four models considered, thus allowing considerable simplification in the calculations to obtain the statistical properties of the density field. In the case of the Coelostat model tests these simplifications cannot be assumed a priori and require further investigation. R.E.S

N80-25592*# Air Force Weapons Lab., Kirtland AFB, N. Mex.

LINE SPREAD INSTRUMENTATION FOR PROPAGATION MEASUREMENTS

Wade H. Bailey, Jr. *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 123-126 refs Also presented at the SPIE Seminar on Laser Technol. for the Atmospheric Sci., San Diego, Calif., 25-26 Aug. 1977 (For primary document see N80-25588 16-34)

Avail: NTIS HC A99/MF A01 CSCL 20D

A line spread device capable of yielding direct measure of a laser beam's line spread function (LSF) was developed and employed in propagation tests conducted in a wind tunnel to examine optimal acoustical suppression techniques for laser cavities exposed to simulated aircraft aerodynamic environments. Measurements were made on various aerodynamic fences and cavity air injection techniques that effect the LSF of a propagating laser. Using the quiescent tunnel as a control, the relative effect of each technique on laser beam quality was determined. The optical instrument employed enabled the comparison of relative beam intensity for each fence or mass injection. It was found that fence height had little effect on beam quality but fence porosity had a marked effect, i.e., 58% porosity alleviated cavity resonance and degraded the beam the least. Mass injection had little effect on the beam LSF. The use of a direct LSF measuring device proved to be a viable means of determining aerodynamic seeing qualities of flow fields. R.E.S.

N80-25593*# Spectron Development Labs., Inc., Costa Mesa, Calif.

AERO-OPTICAL CHARACTERIZATION OF AIRCRAFT OPTICAL TURRETS BY HOLOGRAPHY, INTERFEROMETRY AND SHADOWGRAPH

J. D. Trolinger *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 127-151 Sponsored by AFWL (For primary document see N80-25588 16-34)

Avail: NTIS HC A99/MF A01 CSCL 20D

Density variations in the aircraft boundary layer, turret wakes and shock waves create distortion of an optical wavefront through associated refractive index variations. Such effects can be observed directly through optical flow visualization. The application of holographic interferometry, wave shearing interferometry, and laser shadowgraph to observe and quantify such effects is described. Examples of the results from five different wind tunnel tests are presented. The examples show that diagnostics have provided valuable qualitiative and quantitiative data. These include (1) wake dimensions, (2) optical strength of the flow field, (3) turbulence characterization, (4) shock location, and (5) direct observation of aero-optical effects. R.E.S.

N80-25594*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

UNSTEADY DENSITY AND VELOCITY MEASUREMENTS IN THE 6 FOOT X 6 FOOT WIND TUNNEL

William C. Rose (Rose Eng. and Res., Inc.) and Dennis A. Johnson *In its* Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 153-181 refs (For primary document see N80-25588 16-34)

Avail: NTIS HC A99/MF A01 CSCL 20D

The methods used and the results obtained in four aero-optic tests are summarized. It is concluded that the rather large values of density fluctuation appear to be the result of much higher Mach number than freestream and the violent turbulence in the flow as it separates from the turret. A representative comparison of fairing on-fairing off rms density fluctuation indicates essentially no effect at M = 0.62 and a small effect at M = 0.95. These data indicate that some slight improvement in optical quality can be expected with the addition of a fairing, although at M = 0.62 its effect would be nil. Fairings are very useful in controlling pressure loads on turrets, but will not have first order effects on optical quality. Scale sizes increase dramatically with increasing azimuth angle for a representative condition. Since both scale sizes and fluctuation levels increase (total turbulence path length also increases) with azimuth angle, substantial optical degradation might be expected. For shorter wave lengths, large degradations occur. R.E.S.

N80-25595*# McDonnell Aircraft Co., St. Louis, Mo.

PREDICTION OF OPTICAL PROPAGATION LOSSES THROUGH TURBULENT BOUNDARY/SHEAR LAYERS

A. Verhoff *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 183-229 refs (For primary document see N80-25588 16-34)

Avail: NTIS HC A99/MF A01 CSCL 20D

A simplified mathematical model was developed which predicts the optical propagation losses which occur when an optical beam of given wave length passes through a turbulent boundary layer or shear layer. The optical losses are predicted in terms of line spread function (or Strehl ratio) and modulation transfer function by using experimentally determined values of layer thickness, streamwise, lateral and beamwise density fluctuation length scales, and distribution of the standard deviation of the density fluctuations through the turbulent layer. The prediction model was applied to the analysis of a number of selected cases of interest from the aerodynamic-optical interaction wind-tunnel investigation conducted in the NASA-Ames 1.83 x 1.83 meter (6 x 6 ft) wind tunnel. Direct optical measurements are compared with the results predicted by the aerodynamic analysis. R.E.S.

N80-25596*# Avco-Everett Research Lab., Mass.

ON OPTICAL IMAGING THROUGH AIRCRAFT TURBULENT BOUNDARY LAYERS

George W. Sutton *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 231-252 refs (For primary document see N80-25588 16-34)

(Contract F19628-70-C-0230)

(AMP-334) Avail: NTIS HC A99/MF A01 CSCL 20D

Optical resolution quality as affected by aircraft turbulent boundary layers is analyzed. Wind-tunnel data was analyzed to obtained the variation of boundary layer turbulence scale length and mass density rms fluctuations with Mach number. The data gave good agreement with a mass density fluctuation turbulence spectrum that is either isotropic of orthogonally anisotropic. The data did not match an isotropic turbulence velocity spectrum which causes an anisotropic non-orthogonal mass density fluctuation spectrum. The results indicate that the average mass density rms fluctuation is about 10% of the maximum mass density across the boundary layer and that the transverse turbulence scale size is about 10% of the boundary layer thickness.

The results indicate that the effect of the turbulent boundary layer is large angle scattering which decreases contrast but not resolution. Using extinction as a criteria the range of acceptable aircraft operating conditions are given. M.G.

N80-25597*# Adelphi Univ., Garden City, N. Y.
SECOND MOMENTS OF OPTICAL DEGRADATION DUE TO A THIN TURBULENT LAYER
W. J. Steinmetz *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 253-285 refs (For primary document see N80-25588 16-34)
(Grant NSG-2088)
Avail: NTIS HC A99/MF A01 CSCL 20D

The effect of the thin turbulent layers, including boundary layers and shear layers, on light propagation is examined from a theoretical point of view. In particular, a mathematical model is developed to describe the interaction between the aerodynamic or, more precisely, the density fluctuations and the electromagnetic field. It is assumed that the turbulence induces a normally distributed phase aberration which is a homogenous random function in the plane of the aperture. The optical degradation is described in terms of the optical transfer function and the Strehl ratio which are random. Expressions for the first and second moments of these two parameters are developed from the definitions. Asymptotic (large aperture) approximations to these expressions are derived and discussed. Finally, the exact approximate results are compared for several typical values of the ratios of aperture diameter to scale of density fluctuations and rms phase aberration to wave length respectively. Author

N80-25598*# Naval Postgraduate School, Monterey, Calif.
OPTICAL PHASE DISTORTION DUE TO COMPRESSIBLE FLOW OVER LASER TURRETS
Allen E. Fuhs and Susan E. Fuhs (Calif. Inst. of Tech., Pasadena) *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 287-325 refs Sponsored by AFWL (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

Analytical models for optical phase distortion due to compressible flow over a laser turret are developed. Phase distortion is calculated for both blunt and small perturbation turrets. For the blunt turret, the Janzen-Rayleigh technique is used to determine the flow field. Phase distortions of 2.2 wavelengths at 3.8 microns are calculated for the blunt turret. For small perturbation turrets, a versatile analytical model is developed for a turret on a fuselage with circular cross section. With a two dimensional Fourier series representation of the turret, any shape can be considered. Both subsonic and supersonic flows can be calculated. Phase distortions of 1.2 wavelengths at 3.8 microns are calculated for one turret at high subsonic Mach number. In addition to being of value for laser turrets, the methods are applicable to reconnaissance aircraft using photographic equipment and cruise missiles using celestial navigation. M.G.

N80-25599*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
INVISCID FLOW FIELD EFFECTS: EXPERIMENTAL RESULTS
Leonard J. Otten, III and Keith G. Gilbert *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 327-337 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/ A01 CSCL 20D

The aero-optical distortions due to invisid flow effects over airborne laser turrets is investigated. Optical path differences across laser turret apertures are estimated from two data sources. The first is a theoretical study of main flow effects for a spherical turret assembly for a Mach number (M) of 0.6. The second source is an actual wind tunnel density field measurement on a 0.3 scale laser turret/fairing assembly, with M = 0.75. A range of azimuthal angles from 0 to 90 deg was considered, while the elevation angle was always 0 deg (i.e., in the plane of the flow). The calculated optical path differences for these two markedly different geometries are of the same order. Scaling of results to sea level conditions and an aperture diameter of 50 cm indicated up to 0.0007 cm of phase variation across the aperture for certain forward look angles and a focal length of F = -11.1 km. These values are second order for a 10.6 micron system. M.G.

N80-25600*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPTIMIZED LASER TURRETS FOR MINIMUM PHASE DISTORTION
G. N. Vanderplaats, Allen E. Fuhs (Naval Postgraduate School), and Gregory A. Blaisdell (Calif. Inst. of Tech., Pasadena) *In its* Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 339-362 refs Sponsored by AFWL (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

An analysis and computer program which optimizes laser turret geometry to obtain minimum phase distortion is described. Phase distortion due to compressible, inviscid flow over small perturbation laser turrets in subsonic or supersonic flow is calculated. The turret shape is determined by a two dimensional Fourier series; in a similar manner, the flow properties are given by a Fourier series. Phase distortion is calculated for propagation at serveral combinations of elevation and azimuth angles. A sum is formed from the set of values, and this sum becomes the objective function for an optimization computer program. The shape of the turret is varied to provide minimum phase distortion. M.G.

N80-25601*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
OVERVIEW OF RECENT AERO-OPTICS FLIGHT TESTS
Leonard J. Otten, III *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 363-395 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

A chronological overview of aero-optics test flights is presented highlighting the objectives and conclusions from the tests. Flight tests performed in coordination with the PRESS reentry observation missions and the ALL Cycle 2 laser propagation and tracking demonstrations are described addressing the identification and quantification of distortion phenomena. Finally, current aero-optics flight investigations of an atmospheric turbulence probe are briefly discussed. M.G.

N80-25602*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
LEAR JET BOUNDARY LAYER/SHEAR LAYER LASER PROPAGATION EXPERIMENTS
K. Gilbert *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 397-414 (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

Optical degradations of aircraft turbulent boundary layers with shear layers generated by aerodynamic fences are analyzed. A collimated 2.5 cm diameter helium-neon laser (0.63 microns) traversed the approximate 5 cm thick natural aircraft boundary layer in double pass via a reflective airfoil. In addition, several flights examined shear layer-induced optical degradation. Flight altitudes ranged from 1.5 to 12 km, while Mach numbers were varied from 0.3 to 0.8. Average line spread function (LSF) and Modulation Transfer Function (MTF) data were obtained by averaging a large number of tilt-removed curves. Fourier transforming the resulting average MTF yields an LSF, thus affording a direct comparison of the two optical measurements. Agreement was good for the aerodynamic fence arrangement, but only fair in the case of a turbulent boundary layer. Values of phase variance inferred from the LSF instrument for a single pass through the random flow and corrected for a large aperture ranged from 0.08 to 0.11 waves (lambda = .63 microns) for the boundary layer. Corresponding values for the fence vary from 0.08 to 0.16 waves. Extrapolation of these values to 10.6 microns suggests negligible degradation for a CO2 laser transmitted through a 5 cm thick, subsonic turbulent boundary layer. M.G.

N80-25603*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTICAL MEASUREMENTS OF DEGRADATION IN AIRCRAFT BOUNDARY LAYERS
Dennis Kelsall *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from

Aircraft Apr. 1980 p 415-457 refs Sponsored by AF (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

Visible wavelength measurements of the degradation of optical beams when transmitted through the thin aerodynamic boundary layers around an aircraft are reviewed. The measured results indicated degradation levels for the KC-135 airplanes between 0.10 to 0.13 lambda increasing to 0.18 lambda (rms wavefront distortion). For the Lear Jet, degradation with a 25 mm diameter optics was roughly 0.07 lambda. The corresponding infinite aperture degradation levels are also calculated. The corresponding measured correlation lengths of roughly 12 mm for the KC-135 aircraft and 6 mm for the Lear Jet scale to roughly 20 and 25 mm, respectively, for infinite apertures. These boundary layer correlation lengths do not appear to reflect the different boundary layer thicknesses on the two different aircraft. M.G.

N80-25604*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SUMMARY OF ALL CYCLE II.5 SHEAR AND BOUNDARY LAYER MEASUREMENTS, AERODYNAMICS
William C. Rose (Rose Eng. and Res., Inc.), D. A. Johnson, and Leonard J. Otten, III (AFWL, Kirtland AFB, N. Mex.) *In its* Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 459-464 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

The two measurement systems were used to measure mean velocity and velocity, mass flux, and total temperature fluctuations in the turbulent boundary on the fuselage of a KC-135 aircraft. The boundary layer thickness ranged between about 20 and 30 cm for the range of flight Mach numbers from about 0.25 to 0.85 and Reynolds numbers between 3 and 6 x 10 to the 6th power/m. The adaptation of each system for use in airborne applications is discussed. The data obtained from each system are given and compared with each other and they indicate that the two systems represent viable ones for use in future airborne turbulence experiments. Author

N80-25605*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
CYCLE II.5 AIRCRAFT AERO-OPTICAL TURBULENT BOUNDARY-LAYER/SHEAR-LAYER MEASUREMENTS
K. Gilbert *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 465-491 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

The aero-optical effects associated with propagating a laser beam through aircraft turbulent boundary layers and shear layers were examined. Observed laser optical performance levels were compared with those inferred from aerodynamic measurements of unsteady densities and correlation lengths within these random flows. Optical instrumentation included a fast shearing interferometer (FSI). A 9 cm diameter collimated helium neon laser beam made a double pass through the aircraft random flow via an airfoil mirror located one meter from the fuselage. Typical aircraft turbulent boundary layer thickness measured 0.3 meters. Averaging many FSI generated modulation transfer functions (MTFs) and Fourier transforming, this average yields the expected far field intensity degradation associated with an aircraft mounted laser system. Aerodynamic instrumentation included fine wire probes to measure unsteady temperature and mass flux. A laser doppler velocimeter measured unsteady velocity within the flows. An analysis of these data yielded point measurements of unsteady density and correlation length. R.C.T.

N80-25606*# Rose Engineering and Research, Inc., Incline Village, Nev.
AIRBORNE MEASUREMENT OF ATMOSPHERIC TURBULENCE
William C. Rose and Leonard J. Otten, III (AFWL, Kirtland AFB, N.Mex.) *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 493-514 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

A system capable of making measurements of fluctuating atmospheric density is described. Spatial scales required in assessing the quality of coherent radiation propagation are discussed. The special sensors, aircraft installation, data reduction procedures, and other special requirements necessary to obtain meaningful atmospheric turbulence data are also described. The spectral distribution of density fluctuation are presented. R.C.T.

N80-25607*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
SUMMARY OF AERODYNAMIC VIBRATION EFFECTS ON ALL TURRET
P. Merritt and L. Sher *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 515-535 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

The effects of the airborne environment on a pointing and tracking system using a turret external to an aircraft are summarized. The data covered a series of flight tests and a span of seven years. The two major airborne effects were shown to be direct pressure loading of optical elements and vibrations of the entire turret. The direct optical loading problem was minimized by fence designs for the turret. R.C.T.

N80-25608*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
FLOW VISUALIZATION TECHNIQUES IN THE AIRBORNE LASER LABORATORY PROGRAM
R. E. Walterick and James T. VanKuren *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 537-565 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

A turret/fairing assembly for laser applications was designed and tested. Wind tunnel testing was conducted using flow visualization techniques. The techniques used have included the methods of tufting, encapsulated liquid crystals, oil flow, sublimation and schlieren and shadowgraph photography. The results were directly applied to the design of fairing shapes for minimum drag and reduced turret buffet. In addition, the results are of primary importance to the study of light propagation paths in the near flow field of the turret cavity. Results indicate that the flow in the vicinity of the turret is an important factor for consideration in the design of suitable turret/fairing or aero-optic assemblies. R.C.T.

N80-25609*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
REDUCTION OF UNSTEADY WIND TORQUES ON AN OPEN PORT AIRBORNE OPTICAL TURRET
John P. Thomas, Jr. and James T. VanKuren *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 567-581 refs (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

Techniques for reducing the unsteady torques acting on the inner gimbal of a turret were developed. The reductions in the unsteady torques were obtained by using fixes that alter undesirable flow characteristics or change the acoustic properties of the turret cavity. These fixes were designed to be used in the subsonic and transonic flow regimes. The flow field about the turret generally three dimensional and turbulent, and shock waves formed because of the rapid acceleration of the compressible gas about the blunt turret. The situation was further complicated by the presence of the cavity flow, and the fact that the mouth of the cavity must sweep through a wide angular variation relative to the direction of the freestream. Results indicate that significant reductions of the unsteady pressures measured in the turret cavity could be obtained by the use of porous wind screens around the aperature of the cavity mouth. R.C.T.

N80-25610*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
MEASUREMENT OF EXTERNAL FORCES AND TORQUES ON A LARGE POINTING SYSTEM
R. C. Morenus *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 583-613 (For primary document see N80-25588 16-34)
Avail: NTIS HC A99/MF A01 CSCL 20D

Methods of measuring external forces and torques are discussed, in general and as applied to the Large Pointing System

wind tunnel tests. The LPS tests were in two phases. The first test was a preliminary test of three models representing coelostat, heliostat, and on-gimbal telescope configurations. The second test explored the coelostat configuration in more detail. The second test used a different setup for measuring external loads. Some results are given from both tests. Author

N80-25611*# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Aeromechanics Div.

VALIDITY OF SMALL SCALE TESTS FOR TURRET/FAIRING LOADS AND CAVITY EFFECTS

Daniel J. McDermott and James T. VanKuren *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 615-656 refs (For primary document see N80-25588 16-34)

Avail: NTIS HC A99/MF A01 CSCL 20D

Data from several wind tunnel experiments along with available flight test data are used to discuss the validity of small scale tests and their inherent limitations. Tests were performed at transonic speeds to measure the turbulence levels in a cavity with and without a forward porous fence, turret drag with and without an aerodynamic fairing, and turret/fairing unsteady pressures. R.C.T.

N80-25612*# Air Force Weapons Lab., Kirtland AFB, N. Mex.

AERO-OPTICS OVERVIEW

Keith G. Gilbert *In* NASA. Ames Res. Center Proc. of the Aero-Optics Symp. on Electromagnetic Wave Propagation from Aircraft Apr. 1980 p 657-675 (For primary document see N80-25588 16-34)

Avail: NTIS HC A99/MF A01 CSCL 20D

Various aero-optical phenomena are discussed with reference to their effect on airborne high energy lasers. Major emphasis is placed on: compressibility effects induced in the surrounding flow field; viscous effects which manifests themselves as aircraft boundary layers or shear layers; inviscid flow fields surrounding the aircraft due to airflow around protuberance such as laser turret assemblies; and shocks, established whenever local flow exseds Mach one. The significant physical parameters affecting the interaction of a laser beam with a turbulent boundary layer are also described. R.C.T.

N80-25613*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AN EXPERIMENTAL INVESTIGATION OF CONVECTION IN A FLUID THAT EXHIBITS PHASE CHANGE

D. E. Fitzjarrald May 1980 28 p refs

(NASA-TM-78277) Avail: NTIS HC A03/MF A01 CSCL 20D

Convection flows were systematically observed in a layer of fluid between two isothermal horizontal boundaries. The working fluid was a nematic liquid crystal, which exhibits a liquid-liquid phase change at which latent heat is released and the density changed. In addition to ordinary Rayleigh-Benard convection when either phase is present alone, there exist two types of convective motions initiated by the unstable density difference. When a thin layer of heavy fluid is present near the top boundary, hexagons with downgoing centers exist with no imposed thermal gradient. When a thin layer of light fluid is brought on near the lower boundary, the hexagons have upshooting centers. In both cases, the motions are kept going once they are initiated by the instability due to release of latent heat. Relation of the results to applicable theories is discussed. Author

N80-25614*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

THEORETICAL STUDY OF NONADIABATIC BOUNDARY-LAYER STABILIZATION TIMES IN A CRYOGENIC WIND TUNNEL FOR TYPICAL STAINLESS STEEL WING AND FUSELAGE MODELS

Charles B. Johnson Jul. 1980 43 p refs

(NASA-TM-80212; L-13350) Avail: NTIS HC A03/MF A01 CSCL 20D

The time varying effect of nonadiabatic wall conditions on boundary layer properties was studied for a two dimensional wing section and an axisymmetric fuselage. The wing and fuselage sections are representative of the wing root chord and fuselage of a typical transport model for the National Transonic Facility. The analysis was made with a solid wing and three fuselage configurations (one solid and two hollow with varying skin thicknesses) all made from AISI type 310S stainless steel. The displacement thickness and local skin friction were investigated at a station on the model in terms of the time required for these two boundary layer properties to reach an adiabatic wall condition after a 50 K step change in total temperature. The analysis was made for a free stream Mach number of 0.85, a total temperature of 117 K, and stagnation pressures of 2, 6, and 9 atm. Author

N80-25615*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECTS OF VARIOUS ASSUMPTIONS ON THE CALCULATED LIQUID FRACTION IN ISENTROPIC SATURATED EQUILIBRIUM EXPANSIONS

Joseph W. Bursik (Rensselaer Polytechnic Inst., Troy, N.Y.) and Robert M. Hall Jun. 1980 33 p refs

(NASA-TP-1682; L-13437) Avail: NTIS HC A03/MF A01 CSCL 20D

The saturated equilibrium expansion approximation for two phase flow often involves ideal-gas and latent-heat assumptions to simplify the solution procedure. This approach is well documented by Wegener and Mack and works best at low pressures where deviations from ideal-gas behavior are small. A thermodynamic expression for liquid mass fraction that is decoupled from the equations of fluid mechanics is used to compare the effects of the various assumptions on nitrogen-gas saturated equilibrium expansion flow starting at 8.81 atm, 2.99 atm, and 0.45 atm, which are conditions representative of transonic cryogenic wind tunnels. For the highest pressure case, the entire set of ideal-gas and latent-heat assumptions are shown to be in error by 62 percent for the values of heat capacity and latent heat. An approximation of the exact, real-gas expression is also developed using a constant, two phase isentropic expansion coefficient which results in an error of only 2 percent for the high pressure case. Author

N80-25616*# Stanford Univ., Calif.

FINITE ELEMENT SIMULATION OF SIMPLE THREE-DIMENSIONAL FULLY CAVITATING FLOWS Final Report, 10 Oct. 1974 - 31 Dec. 1979

Peter Y. Ko and Robert L. Street Nov. 1979 126 p refs

(Contract N00014-75-C-0277; SR0230101)

(AD-A082823; TR-241) Avail: NTIS HC A07/MF A01 CSCL 20/4

Based on potential flow theory, a formulation is given for three dimensional fully cavitating flow with a Riabouchinsky model. The model is nonlinear and the location of the free surface of the cavity is not known priori. Therefore, an iterative procedure is used to locate the free surface boundary. The employment of a trial free-boundary approach effectively reduces the fully nonlinear model to a linear one, and the solution at each iteration is obtained by means of the finite element method (FEM). Examples studied were fully cavitating flow past flat plates in a water tunnel. Results are given for pure drag flows past circular and elliptic plates and a lifting flow past a circular plate. Because of the change in flow boundary conditions at the separation edge and the failure of the FEM to resolve these conditions accurately, the ability of the numerical solution to maintain a constant pressure over the entire cavity decreases as the three dimensionality of the free surface increases. However, the present procedure produces absolutely stable iterations and shows no sign of drifting of the free surface. It is found that satisfaction of a tangent separation condition of the free surface from the flat plate body is crucial for the stability of the iterative procedure. Grid refinement in both the streamwise and transverse directions reduces the computational error. GRA

N80-25617# Sandia Labs., Albuquerque, N. Mex.

MEASUREMENT OF WEAK SHOCK-WAVE PROFILES

S. Winkler (Inst. fuer Festkoerpermech.) 7 Nov. 1979 13 p refs Transl. into ENGLISH of paper presented at High Speed Phys., the Spring Meeting of the German Phys. Soc., Hannover, West Germany, 25 Feb. 1976 10 p Sponsored by DOE

(SAND-79-6004; CONF-760276-1) Avail: NTIS HC A02/MF A01

Shock waves in solids and how their profiles can reflect

material properties are discussed. Pressure measurement with bimetallic contracts is described. A proportionality exists between the electrical voltage of thermocouples and the pressure giving rise to it. Application and advantages of this method are discussed. Results are presented for an iron flyer plate on Armco iron, an Al flyer on iron, and an austenitic Cr-Ni steel flyer on the same material. Impact pressures are also computed. DOE

N80-25618# Virginia Polytechnic Inst. and State Univ., Blacksburg.
HEAT CONDUCTION IN PARTIAL VACUUM Technical Progress Report, 7 Aug. 1978 - 31 Jan. 1979
J. R. Thomas Feb. 1979 32 p refs
(Contract EM-78-C-04-5367)
(ALO-5367-1) Avail: NTIS HC A03/MF A01

Basic theoretical work on heat conduction in evacuated solar collectors is reported. The results include estimates for minimum partial vacuum necessary to eliminate conduction, and the effects of helium penetration into the region. DOE

N80-25619# California Univ., Livermore. Lawrence Livermore Lab.
BRIGHTNESS TEMPERATURE MEASUREMENTS FOR HIGH-ENERGY JET PROPAGATION
H. D. Glenn 16 Jan. 1980 13 p refs Presented at the DNA Symp. on Fiber Optics in the Nucl. Environ., Adelphi, Md., 25-27 Mar. 1979 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-83609; CONF-800307-2) Avail: NTIS HC A02/MF A01

The use of fiber optics to measure times of arrival and brightness temperature profiles for high-energy gas jets is described. Voitenko compressors were used to produce high-energy air and oxygen jets through steel pipes 2 cm i.d. and 350 cm in length containing air initially at 0.02 Torr or less. Reduction of the time-of-arrival data indicated that velocities for the various identified jet components ranged between 2.40 and 7.95 cm/microsec. The fiber optics emplacement design and brightness temperature calibration procedure are described. Maximum brightness temperatures of 93,000 and 136,000 K were measured for air and oxygen jets, respectively, as they started down the exit pipes. Brightness temperature profiles were obtained to 50 microsec behind the jet front. The results suggest that delayed entrainment of wall material was the predominant factor in reducing pressures and temperatures in the slower components of the jet. DOE

N80-25620# Iowa State Univ. of Science and Technology, Ames. Dept. of Chemical Engineering.
SIMULATION OF CHEMICAL REACTION IN A TURBULENT FLOW
James C. Hill 1979 28 p refs Presented at Chem. Eng. Res. Symp., Ames, Iowa, 8 Mar. 1979 Sponsored in part by National Center for Atmospheric Research
(Contract W-7405-eng-82)
(ISM-253; CONF-7903109-1) Avail: NTIS HC A03/MF A01

The mass conservation equations for chemical species undergoing convection, diffusion, and irreversible chemical reaction were numerically integrated over time using a numerical simulation of two-dimensional, homogeneous, turbulent velocity fields with assignable statistical properties. Statistical independence hypotheses, proposed by O'Brien for single-species reactions and by Toor for two-species reactions, were tested by comparing exact statistical quantities during evolution of the concentration fields. DOE

N80-25621# Hazleton-Nuclear Science Corp., Palo Alto, Calif.
NEW MATHEMATICAL TECHNIQUE FOR DETERMINING THE PARAMETERS OF GAS PERMEATION THROUGH SOLIDS
John F. Kohls 1980 30 p refs Presented at 9th Ann. Symp. of the Florida Chapter of the Am. Vacuum Soc., Tampa, 11-13 Feb. 1980
(Contracts EY-76-C-04-0656; DE-AC04-76DP-00656)
(GEPP-OP-474; CONF-800214-1) Avail: NTIS HC A03/MF A01

The solution of Fick's equation for gas permeation through solid flat membranes yields a throughput rate equation with two unknown parameters, diffusivity and solubility. The common methods used to evaluate these parameters rely on knowing the equilibrium throughput rate. This equilibrium rate is in some cases rapidly established (on the order of seconds) in other cases slowly established (order of months). Thus, permeation measurements may require equipment usage over a long time period, precluding its use for other experiments. A mathematical technique for predicting the permeation parameters using the unequilibrated portion of the permeating throughput curve has been developed which overcomes this difficulty. The method developed (termed stabilized search) was tested with data simulated using a known amount of error. The predicted parameters were as accurate as the data, but the values were generated in only 20 to 40% of the time required for other methods. DOE

N80-25622# General Electric Co., Schenectady, N. Y. Mechanical Systems and Technology Lab.
LAMINAR FLOW CYCLONE DEVELOPMENT PROGRAM Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1979
W. B. Giles and K. L. Bekofske Jul. 1979 32 p
(Contract ET-78-C-01-3242)
(FE-3242-8) Avail: NTIS HC A03/MF A01

The objective of this program is to develop a laminar flow cyclone concept which could have a marked reduction in collection cut size, improved efficiency, increased throughput per unit volume, and potentially low capital cost relative to more conventional high efficiency collectors. An analysis of the radial inlet swirl flow including the effects of the free-stream velocity components was completed. The principal constraint to high Reynolds number operation is due to boundary layer instability in the radial inflow region. Therefore, a modified model was built to study the influence of inlet wall heating with the water flow model. DOE

N80-25623# Sandia Labs., Albuquerque, N. Mex.
LONG TUBE HEAT EXCHANGER: THE FACILITY AND SOME PRELIMINARY TESTS ON THE DOWN CENTER/UP ANNULAR FLOW CONFIGURATION
D. O. Lee, R. W. Johnson, and R. L. Weatherbee Mar. 1980 63 p refs
(Contract EY-76-C-04-0789)
(SAND-78-0823) Avail: NTIS HC A04/MF A01

A test facility was designed and constructed to study forced flow boiling heat transfer in a closed loop long tube heat exchanger which is a two concentric-tube vertical design. The system consists of a 12 m long heat exchanger which can be operated at pressures to 689.3 kPa with pumped or natural convection flow rates from 0.0631 to 0.631 liters/second and which can be irradiated with a maximum steady heat flux rate of 50 kW sq m by a set of resistive heaters operable at temperatures up to 1250 C. The facility was also designed so that other heat exchanger configurations can be tested with minimum difficulty (i.e., little or no modification of the system other than to replace the heat exchanger). The preliminary tests indicate that the system can be operated in a stable mode. This facility was motivated primarily by the magma energy research program where energy is extracted from magma by heat exchangers similar to the configuration in this report. DOE

N80-25624*# Sandia Labs., Albuquerque, N. Mex. Gas Dynamics Div.
CALCULATION OF SKIN-FRICTION COEFFICIENTS FOR LOW REYNOLDS NUMBER TURBULENT BOUNDARY LAYER FLOWS M.S. Thesis - California Univ. at Davis
Pamela K. Barr Jan. 1980 82 p refs
(Contracts NCA2-OR180-704; EY-76-C-04-0789)
(NASA-CR-163062; SAND-79-8062) Avail: NTIS HC A05/MF A01 CSCL 20D

An analysis is presented of the reliability of various generally accepted empirical expressions for the prediction of the skin-friction coefficient C/sub f/ of turbulent boundary layers at low Reynolds numbers in zero-pressure-gradient flows on a smooth flat plate. The skin-friction coefficients predicted from these expressions were compared to the skin-friction coefficients of experimental profiles that were determined from a graphical method formulated from the law of the wall. These expressions are found to predict values that are consistently different than

those obtained from the graphical method over the range 600 < Re/sub theta < 2000. A curve-fitted empirical relationship was developed from the present data and yields a better estimated value of C/sub f/ in this range. The data, covering the range 200 < Re/sub theta < 7000, provide insight into the nature of transitional flows. They show that fully developed turbulent boundary layers occur at Reynolds numbers Re/sub theta/ down to 425. Below this level there appears to be a well-ordered evolutionary process from the laminar to the turbulent profiles. These profiles clearly display the development of the turbulent core region and the shrinking of the laminar sublayer with increasing values of Re/sub theta/. DOE

N80-25625# Los Alamos Scientific Lab., N. Mex.
INTRODUCTION TO DETONATION PHENOMENA
William C. Davis 1979 33 p refs Presented at Working Group Meeting on Detonation Phenomena, Menlo Park, Calif., 23-24 Oct. 1979
(Contract W-7405-eng-36)
(LA-UR-79-2880; CONF-791084-1) Avail: NTIS HC A03/MF A01

The paper serves as an introduction to detonation phenomena for scientists who work in other fields. DOE

N80-25626# Sandia Labs., Albuquerque, N. Mex.
CORRELATION OF NOSETIP BOUNDARY-LAYER TRANSITION DATA MEASURED IN BALLISTICS-RANGE EXPERIMENTS
Daniel C. Reda Jan. 1980 16 p refs Presented at the 18th AIAA Aerospace Sci. Meeting, Pasadena, Calif., 14 Jan. 1980
(Contract EY-76-C-04-0789)
(SAND-79-0649C; CONF-800104-1) Avail: NTIS HC A02/MF A01

Preablated nosetips of various carbonaceous materials were tested in a ballistics range. Surface-temperature contours, measured with image-converter cameras, were used to define boundary-layer transition-front contours. Measurements of surface roughness, surface temperature, average transition-front location, and freestream environment were combined with calculations of nosetip flowfields, and with calculations of laminar boundary-layer development in these flowfields, to transform all data into various dimensionless parameters. These parameters were defined by previous attempts to correlate existing wind-tunnel data for transition on rough/blunt bodies. Of the available correlating techniques, only one, based on the concept of a constant (critical) roughness Reynolds number for transition, was found to succes-fully describe both the wind-tunnel and ballistics-range data, thereby validating the extrapolation of this concept to actual reentry-vehicle materials and environments. DOE

N80-25627# California Univ., Berkeley. Lawrence Berkeley Lab.
GAS-PARTICLE FLOW IN THE ENTRY REGION OF A CURVED PIPE Ph.D. Thesis
Woon-Shing Yeung Apr. 1979 100 p refs
(Contract W-7405-eng-48)
(LBL-9905) Avail: NTIS HC A05/MF A01

The flow of a dilute gas-particle mixture entering a circular curved pipe was investigated. The fluid is assumed to be incompressible and the flow nonseparating and laminar. Final results are presented and compared with other theoretical and experimental results. Since an irrotional core is assumed, the uniform entry profile changes to a two dimensional potential vortex shortly downstream of the entry section. This is consistent with published experimental data. There is also a cross flow directed from the outer bend towards the inner bend in the immediate neighborhood of the entry section. The dynamics of the particle phase are discussed. Lagrangian equations of motion for the particle phase are used. Due to the complexity of the momentum coupling between the two phases. (i.e., the gas phase and the particle phase), only the first order solution for the particle phase were obtained by neglecting its effect on the gas flow field. This has been proved adequate, for example in the erosion calculation of a curved pipe carrying a gas-solid mixture. Asymptotic expansion solutions for the particle trajectories are discussed. Finally, the density of the particle at the pipe wall is presented and the numerical results are discussed. DOE

N80-25628# Union Carbide Corp., Oak Ridge, Tenn. Computer Science Div.
CALCULATION OF FLUID CIRCULATION PATTERNS IN THE VICINITY OF SUBMERGED JETS USING ORSMAC
James E. Park and Kenneth E. Cross Jan. 1980 135 p refs
(Contract W-7405-eng-26)
(K/CSD-4) Avail: NTIS HC A07/MF A01

As the world demand for electricity is met by large coal or nuclear fueled central generating stations, the effluent streams from these plants will have an increasingly important impact on the local environment. The Nuclear Regulatory Commission has a responsibility to assess the impact of proposed and operating nuclear power plants. To support this NRC mission, a numerical algorithm and associated computer program were developed to predict the temperatures occurring in the immediate vicinity (the near field) of a hot water discharge from a power plant. The algorithm is a natural extension of the classic Marker-and-Cell (MAC) technique developed by F.H. Harlow at the Los Alamos Scientific Laboratory. ORSMAC adds the logic for simple turbulence modeling, energy conservation and buoyancy effects to the MAC model. Modern numerical techniques were used wherever practical. The MAC and SMAC (Simplified MAC) algorithms are reviewed, and the ORSMAC algorithm is described. The finite difference analogs are given and discussed. Solutions for several sample problems are presented which illustrate the features of the ORSMAC algorithm. A complete FORTRAN listing is included with input and sample output. Recommendations for further testing are included. DOE

N80-25629# Texas Univ., Austin.
DETERMINATION OF FRICTION FACTORS AND HEAT TRANSFER COEFFICIENTS FOR FLOW PAST ARTIFICIALLY ROUGHENED SURFACES Ph.D. Thesis
S. A. Hodge Dec. 1979 214 p refs
(Contract EY-76-C-05-0033)
(DOE/TIC-10283) Avail: NTIS HC A10/MF A01

Because convective heat transfer is enhanced in flow past rough surfaces, much experimental and analytical effort over the past several decades has been devoted to the evaluation of artifical roughening for potential application to the heat transfer surfaces of gas-cooled reactors. Unfortunately, much of the analytical development in this field has been inadequately explained in the literature; this led to misinterpretation of some of the subsequent experimental findings, compounding the uncertainty. A critical review is given of the underlying assumptions, theoretical foundations, and supporting experimental evidence for the analytical procedures in current use for the evaluation of roughness effects. A concise presentation of the available formulations with recommendations concerning their applicability to rough rod bundles is presented. DOE

N80-25630# Oak Ridge National Lab., Tenn.
PERFORMANCE EVALUATION OF A SELECTED THREE-TON AIR-TO-AIR HEAT PUMP IN THE HEATING MODE
A. A. Domingorena and S. J. Ball Jan. 1980 106 p refs
(Contract W-7405-eng-26)
(ORNL/CON-34) Avail: NTIS HC A06/MF A01

An air-to-air split system residential heat pump of nominal under laboratory conditions. This was the second of a planned series of experiments to obtain a data base of system and component performance for heat pumps. The system was evaluated under both steady-state and frosting-defrosting conditions; sensitivity of the system performance to variations in the refrigerant charge was measured. From the steady-state tests, the heating capacity and coefficient of performance were computed, and evaluations were made of the performance parameters of the fan and fan motor units, the heat exchangers and refrigerant metering device, and the compressor. System heat losses were analyzed. The frosting-defrosting tests allowed the observation of system and component performance under dynamic conditions, and measurement of performance degradation under frosting conditions. DOE

N80-25631# Argonne National Lab., Ill. Reactor Analysis and Safety Div.
LOCAL DRAG LAWS IN DISPERSED TWO-PHASE FLOW
M. Ishii and T. C. Chawla Dec. 1979 45 p refs
(Contract W-31-109-eng-38)

(NUREG-CR-1230; ANL-79-105) Avail: NTIS HC A03/MF A01

The ability to predict the interfacial drag between phases of considerable importance for analyzing a dispersed two-phased system undertransient conditions. Constitutive relations are developed for the drag force for bubbly, droplet, and particulate flows by a unified method. Simple drag similarity criteria and a mixture viscosity model are introduced in the analysis. The present drag correlation cover all concentration ranges and wide Reynolds number ranges, from the Strokes regime up to the Newton's regime or the churn-turbulent-flow regime. DOE

N80-25632# National Technical Information Service, Springfield, Va.

FLUID CONTROL DEVICES, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1972 - Jan. 1980

Guy E. Habercom, Jr. Feb. 1980 292 p Supersedes NTIS/PS-79/0199; NTIS/PS-78/0189 and NTIS/PS-77/0181 (PB80-805260; NTIS/PS-79/0199; NTIS/PS-78/0189; NTIS/PS-77/0181) Avail: NTIS HC $30.00/MF $30.00 CSCL 13G

The design, fabrication, application, and performance of fluidic and flueric control devices are described in these Government-sponsored research reports. This updated bibliography contains 285 abstracts, 18 of which are new entries to the previous edition. GRA

N80-25633# National Technical Information Service, Springfield, Va.

FLUID CONTROL DEVICES. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1974 - Feb. 1979

Guy E. Habercom, Jr. Feb. 1980 371 p Supersedes NTIS/PS-79/0120 and NTIS/PS-78/0190 (PB80-805278; NTIS/PS-79/0120; NTIS/PS-78/0190) Avail: NTIS HC $30.00/MF $30.00 CSCL 13G

The design, fabrication, application, and performance of fluidic and flueric control devices are described in these abstracts of reports gathered in a worldwide literature survey. This updated bibliography contains 364 abstracts, 21 of which are new entries to the previous edition. GRA

N80-25487# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

RESOLUTION OF NAVIER-STOKES EQUATIONS BY A SPACE-TIME PSEUDO-SPECTRAL METHOD

Yves Morchoisne *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 11-31 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 293-306 Original report in FRENCH previously announced as A80-12355 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

N80-25488# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

UNSTEADY AEROTHERMODYNAMICS MODELING

Francis Hirsinger *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 33-54 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 307-323 Original report in FRENCH previously announced as A80-12356 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

N80-25489# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

TRANSONIC SMALL PERTURBATION EQUATION APPLIED TO THE SOLUTION OF TWO-DIMENSIONAL UNSTEADY FLOWS

Michel Couston, Jean-Jacques Angelini, and Pierre Mulak *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 55-73 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 325-340 Original report in FRENCH previously announced as A80-12357 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N80-25634# National Physical Lab., Teddington (England).

DESIGN AND CONSTRUCTION OF THE BOYD-ENGLAND HIGH PRESSURE APPARATUS

W. F. Wall Apr. 1980 22 p refs
(NPL-CHEM-110; ISSN-0143-7003) Copyright. Avail: Issuing Activity

The component materials, design, and construction procedures for a high pressure apparatus, for work in experimental petrology at temperatures up to 1600 C with pressures up to 4 GN/sq m are described. It is of simple construction, and electrical leads may readily be taken into the reaction zone, enabling measurements to be made under conditions of high pressure and high temperature. The apparatus consists of a tungsten carbide thick walled cylinder supported by a second thick walled cylinder of high strength steel, the two cylinders having a large interference fit. The compound formed by these two components is end-loaded with 400 Tonf via two water cooled pads, and a tungsten carbide piston is driven into the bore by a secondary ram to generate the high pressure within the base of the cylinder. M.G.

N80-25635*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTERIZED VIDEO DENSITOMETRY METHOD FOR RAPID ANALYSIS OF INFRARED PHOTOGRAPHIC IMAGES

Ernest Roberts, Jr., Frederick D. Calfo, and Frank G. Pollack Jun. 1980 13 p refs
(NASA-TP-1686; E-354) Avail: NTIS HC A02/MF A01 CSCL 14E

A computerized video densitometry method is described which is approximately 50 times faster than a corresponding manual method of analysis, with no apparent sacrifice of accuracy. The object of the technique is to determine the temperature distribution across a heated surface. Infrared photographs of the heated surfaces provide the raw data. A video based, computer operated image analysis system provides the equipment. Infrared photographic pyrometry using a flat bed microdensitometer forms the basis of the technique. The procedure is illustrated on a thermally cycled aircraft gas turbine blade. A.R.H.

N80-25636# Maryland Univ., College Park. Computer Vision Lab.

A MEDIAL AXIS TRANSFORMATION FOR GRAYSCALE PICTURES Interim Report

Shyuan Wang, Azriel Rosenfeld, and Angela Y. Wu Dec. 1979 17 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A081347; TR-843; AFOSR-80-0139TR) Avail: NTIS HC A02/MF A01 CSCL 14/15

Blum's medial axis transformation (MAT) for binary pictures yields medial axis points that lie midway between opposite borders of a region, or along angle bisectors. This note discusses a generalization of the MAT in which a score is computed for each point P of a grayscale picture based on the gradient magnitudes at pairs of points that have P as their midpoint. These scores are high at points that lie midway between pairs of antiparallel edges, or along angle bisectors, so that they define a MAT-like skeleton, which we may call the GRADMAT. However, this skeleton is rather sensitive to the presence of noise edges or to irregularities in the region edges. GRA

N80-25637# RCA Advanced Technology Labs., Camden, N. J.

ADVANCED IMAGE COMPRESSION STUDY Final Technical Report, 30 Sep. 1977 - 21 May 1979

W. B. Schaming and J. J. Rudnick Jan. 1980 119 p refs
(Contract F30602-77-C-0244; AF Proj. 6244)
(AD-A082014; RADC-TR-79-342) Avail: NTIS HC A06/MF A01 CSCL 14/5

The work described in this report primarily covers two areas. The first effort described is an attempt to group images for bandwidth compression using clustering techniques on statistical measurements. The second effort is an attempt to predict the performance of the cosine transform algorithms from statistics derived from the imagery. GRA

N80-25638# Naval Surface Weapons Center, Dahlgren, Va.
DATA GENERATOR FOR A SATELLITE-BORNE THREE-AXIS ACCELEROMETER Final Report
Carol G. Branch Mar. 1980 65 p refs
(AD-A082827; NSWC/DL-TR-3849) Avail: NTIS HC A04/MF A01 CSCL 22/3

Atmospheric drag has a significant effect on low altitude trajectories. To measure this force, an accelerometer will be tested which senses this nonconservative acceleration. The information obtained will then be used to improve the orbit and obtain a more accurate gravity field model. When the raw data is first received, all known systematic effects will be removed. These include gravity gradient and pitch-rate induced accelerations. However, the preprocessed data will still contain anomalies of which there is little or no a priori knowledge. Satellite attitude thruster-induced vibrations are a major source of unmodeled noise. As for the instrument itself, each axis of the accelerometer adds an undetermined bias to the output accelerations. In addition, the conversion of the digital output to engineering units introduces a scale factor error. Other effects may take the form of additive correlated noise and white noise. The first instrument to be flown is the miniature electrostatic accelerometer (MESA). The MESA senses accelerations along the vehicle pitch, roll, and yaw axes. Relying on the accuracy of the vehicle's attitude control system, these axes are assumed to be along the R,R X V, and -R vectors, respectively. Hence, any attitude errors will be reflected in the measurements. The MESA also introduces undetermined scale factor errors and biases. Consequently, a computer program was designed which applies a filter to the processed accelerations. This filter should statistically remove most of the unmodeled corruptions. The filtered data is then input to a special version of the Celest orbit determination program. GRA

N80-25639# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Mobility and Environmental Systems Lab.
INNOVATIONS IN DIGITAL IMAGE PROCESSING Final Report
Albert N. Williamson Feb. 1978 39 p ref
(AD-A082048; WES-MP-M-78-4) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper discusses a technique for producing suspended material distribution maps by spectrum matching and two different techniques for detecting time-dependent changes recorded by the LANDSAT MSS-computer-generated false color composites for visual interpretation and detection by pixel-for-pixel comparison. Included in the paper are some of the results of a course of study and development at the U. S. Army Engineer Waterways Experiment Station (WES) that have produced a family of computer programs and algorithms designed to extract meaningful geometric and radiometric information from digitized image data, interpret the data, and depict the results as tabular lists printed with conventional line printers or as images on photographic film that can be used to make photographic images, maps, or charts. Specifically described are the equipment used for image data processing and applications of image data processing techniques for (a) suspended material distribution mapping, (b) production of color composites from LANDSAT computer-compatible tapes, (c) change detection, and (d) generation of color separations for offset printing. GRA

N80-25640# Argonne National Lab., Ill. Components Technology Div.
INVESTIGATION LEADING TO THE DEVELOPMENT OF AN ACOUSTIC DOPPLER SLURRY FLOWMETER
H. B. Karplus and A. C. Raptis Jun. 1979 39 p
(Contract W-31-109-eng-38)
(ANL-FE-49622; TM-06) Avail: NTIS HC A03/MF A01

The sonic Doppler shift principle is investigated for the measurement of high concentration coal slurries (5 to 40% solid). A noninvasive system having a transducer on the outside of the pipe is especially attractive for safety and convenience in operation and maintenance. The ideal single frequency scattered energy is not realized in practice but a broad band of scattered energy is observed. The spectrum has a definite maximum value close to the expected Doppler frequency. A single number output can be obtained by amplitude limiting the difference frequency between transmitted and received signal and counting zero crossings. DOE

N80-25641# California Univ., Livermore. Lawrence Livermore Lab.
PROSPECTS FOR GENERATING 1-10 TPa PRESSURES WITH A RAILGUN
R. S. Hawke and J. K. Scudder 2 Oct. 1979 6 p refs Presented at the 7th Intern. High Pressure AIRAPT Conf. Le Creusot, France, 30 Jul. - 3 Aug. 1979 Revised
(Contract W-7405-eng-48)
(UCRL-82296-Rev-2; CONF-790709-4-Rev-2) Avail: NTIS HC A02/MF A01

It has been demonstrated that a plasma arc can be accelerated along two current carrying parallel rails and used to accelerate a projectile. An extensive analysis found the task of using a railgun to accelerate an impactor plate to velocities of 10 to 40 mm. micro-A to be feasible with contemporary technology. This range of impact velocities would enable shock pressures of 1 to 10 TPa to be generated for EOS research. DOE

N80-25642# Argonne National Lab., Ill.
HOT CELL MEASURING AND TEST EQUIPMENT CALIBRATION CONTROL
Kenneth J. Taylor 1979 17 p refs Presented at Am. Nucl. Soc. - RSTD Conf., San Francisco, 11-15 Nov. 1979
(Contract W-31-109-eng-38)
(CONF-791103-73) Avail: NTIS HC A02/MF A01

The need for increasingly accurate date on the performance of fuels and materials in nuclear reactors has placed increased emphasis on the quality of measurement of data obtained in hot cells. A program was proposed to incorporate the basic features of a standard measurement laboratory while recognizing the unique aspect of hot cell measurements. That hot cells must comply with calibration procedures in order to maintain control of measurement parameters was the basis for the system proposed for implementation in the Hot Fuel Examination Facility at the Argonne-West Site, Idaho Falls, Idaho. DOE

N80-25643# Sandia Labs., Albuquerque, N. Mex. Electrical Standards Lab.
SEMIAUTOMATED CALIBRATION: A CASE STUDY
John C. Cunningham 1979 13 p Presented at 26th Intern. Instrumentation Symp., Seattle, 5 May 1980
(Contract EY-76-C-04-0789)
(SAND-79-2004C; CONF-800502-7) Avail: NTIS HC A02/MF A01

A semiautomatic system for use in calibrating digital voltmeters, fixed resistors, and potentiometers is described. Its development from its beginnings in 1970 to the present is traced and some of the problems encountered with ground loops and resistance of the switches and cables are reviewed. Some implications for the future are discussed. DOE

N80-25644# Oregon Univ., Eugene. Inst. of Theoretical Science.
CORRELATION HOLOGRAPHY: IMAGING OF ATOMS WHEN SIGMA SUB (INELASTIC) >>SIGMA SUB (ELASTIC)
Paul L. Csonka 1979 10 p refs
(Contract EY-76-S-06-2230-004)
(DOE/ER-70004/258; RLO-2230-T42-58) Avail: NTIS HC A02/MF A01

Atomic scale resolution of details is possible with this method, even if protons interact with the atoms overwhelmingly inelastically, i.e., when sigma sub inelastic > > sigma sub elastic. Observation of small objects is compatible with quantum mechanics even if the disturbance of the object caused the observation process is arbitrarily small. DOE

N80-25645# Du Pont de Nemours (E. I.) and Co., Aiken, S. C.
COMPUTER CONTROL FOR A CLADDING THICKNESS TESTER

R. J. Sand Dec. 1979 14 p refs
(Contract EY-76-C-09-0001)
(DP-1537) Avail: NTIS HC A02/MF A01

A cladding thickness tester for extruded reactor fuel tubes was automated to provide reduced operator interaction. The classing thickness tester, which uses an X-ray fluorescence analyzer, was interfaced with an SRL/6800 microcomputer to control fuel tube orientation, operate the analyzer, calculate cladding thickness, and give pertinent data in hardcopy tabular form. DOE

N80-25290# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Rechenzentrum.
PROCESSING OF AIDS FLIGHT RECORDER DATA FOR A QUICK-LOOK WITH THE AID OF A HYBRID SYSTEM
H. Hoffmann *In its* Aircraft Integrated Data Systems Feb. 1979 p 34-362 In GERMAN; ENGLISH summary (For primary document see N80-25275 16-01)
Avail: NTIS HC A16/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-25646 Washington Univ., Seattle.
FLUID PROCESSES IN SUPERSONIC DIFFUSION LASERS Ph.D. Thesis
George William Butler 1979 132 p
Avail: Univ. Microfilms Order No. 8013504

The pressure distribution is measured downstream of two different screen nozzles in a combination shock-Ludwieg tube facility that mixes pure A or a 5% F/A oxidizer with H2 fuel. Oxidizer mixtures are thermally dissociated at the shock tube endwall and expanded through alternate columns of the nozzle array to the test section. Unheated fuel mixtures are simultaneously supplied to the companion nozzle columns by the Ludwieg tube. The expanded fuel and oxidizer mix and react downstresm, producing excited state HF and coupling significant amounts of energy back to the fluid. The combustion pressure data supports the development of a quasi one dimensional model which is used to identify and isolate prominent fluid processes. The combustion sensitivity to nonideal expansions, overall and relative shear layer entrainment, base entrainment and base pressure is examined and appropriate reference conditions selected. The theory is found to be in agreement with the experimental results. The model is then used to calculate HF laser performance for a typical flow condition. The intensity profiles demonstrate the significant influence of the principal flow processes.
Dissert. Abstr.

N80-25647# Army Missile Research and Development Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.
ACTIVE/PASSIVE LONG WAVELENGTH INFRARED (LWIR) LASER GUIDANCE
M. D. Blue and G. R. Loefer 31 Jul 1979 51 p refs
(AD-A082509; DRSMI-RE-CR-80-1) Avail: NTIS HC A04/MF A01 CSCL 17/7

A technical assessment has been made of the opportunities for the use of two or more wavelengths, or of passive and active optical systems, acting in combination for the purpose of missile guidance and target acquisition. In addition, considerations relative to the choice of waveband and current state-of-the-art in components and signal processing are related to requirements for guidance systems. Adverse environments and fire-and-forget capability are emphasized. Most dual wavelength systems described in the literature are of little value for the missile guidance and target acquisition problem where the target is likely to be imbedded in strong clutter. The combination of an active and passive system does offer a unique combination of advantages in contrast to other combinations of active-active and passive-passive systems. The characteristics of active-passive systems operating in the 8-14 micrometer wavelength region are discussed. The desirability of this wavelength region and the favorable status of component technology for the wavelength region make this an attractive alternative for seekers or trackers for missile guidance. The study also shows the strong need for more data on active signatures for both targets and clutter. GRA

N80-25648# State Univ. of New York at Albany.
THE EFFECT OF ATMOSPHERIC PARTICULATE MATTER ON THE PROPAGATION OF A LASER BEAM Final Report, 1 Jan. - 31 Dec. 1979
Petr Chylek Apr. 1980 51 p
(Grant DAAG29-79-G-0031)
(AD-A083039; ARO-16508.2-GS) Avail: NTIS HC A04/MF A01 CSCL 20/6

Contents: light scattering by a pair of conjugate nonspherical particles; verification of a linear relation between IR extinction, absorption and liquid water content of fogs; perturbation approach to light scattering by nonspherical particles; and surface waves in light scattering by nonspherical particles. GRA

N80-25649# Los Alamos Scientific Lab., N. Mex.
SHORT-PULSE CO2-LASER DAMAGE STUDIES OF NaCl AND KCl WINDOWS
B. E. Newnam, Andrew V. Nowak, and Dennis H. Gill 1979 22 p refs Presented at the 11th Ann. Symp. on Opt. Mater. for High Power Lasers, Boulder, Colo., 30 Oct. 1979
(Contract W-7405-eng-36)
(LA-UR-80-108; CONF-7910101-2) Avail: NTIS HC A02/MF A01

The damage resistance of bare surfaces and the bulk interior of NaCl and KCl windows was measured with a short-pulse CO2 laser at 10.6 microns. Parametric studies with 1.7 ns pulses indicated that absorbed water was probably the limiting agent on surface thresholds in agreement with previous studies at long pulsewidths. Rear-surface thresholds up to 7 J/cu cm were measured for polished NaCl windows, whereas KCl surfaces damaged at approximately 60% of this level. The breakdown electric field thresholds of exit surfaces were only 50% of the value of the bulk materials. The pulsewidth dependence of surface damage from 1 to 65 ns, in terms of incident laser fluence, increased as t/sup 1/3/. DOE

N80-25650# California Univ., Livermore. Lawrence Livermore Lab.
LASER PROGRAM, VOLUME 3 Annual Report, 1978
Michael J. Monsler, ed. and Brian D. Jarman, ed. Mar. 1979 266 p refs 3 Vol.
(Contract W-7405-eng-48)
(UCRL-50021-78-Vol-3) Avail: NTIS HC A12/MF A01

Progress in advanced quantum electronics, primarily the quest for advanced rep-rateable short wave length lasers with high efficiency, is documented. Application studies in electrical energy production and fissile fuel production are also described. Selected highlights of the advanced isotope separation program are also presented. DOE

N80-25651# California Univ., Livermore. Lawrence Livermore Lab.
LASER PROGRAM, VOLUME 2 Annual Report, 1978
Michael J. Monsler, ed. and Brian D. Jarman, ed. Mar. 1979 254 p refs 3 Vol.
(Contract W-7405-eng-48)
(UCRL-50021-78-Vol-2) Avail: NTIS HC A12/MF A01

Laser fusion experiments and analyses are detailed. The technology development programs required for the high performance needed in target diagnostic instrumentation and in solid state laser components are reviewed. DOE

N80-25652# California Univ., Livermore. Lawrence Livermore Lab.
LASER PROGRAM, VOLUME 1 Annual Report, 1978
Michael J. Monsler, ed. and Brian D. Jarman, ed. Mar. 1979 243 p refs 3 Vol.
(Contract W-7405-eng-48)
(UCRL-50021-78-Vol-1) Avail: NTIS HC A11/MF A01

An overview of the progress and resources of a laser fusion program is given. The Argus, Shiva, and Nova facilities are described. The theory of fusion target design is discussed along with specialized techniques of target fabrication. DOE

N80-25653# California Univ., Livermore. Lawrence Livermore Lab.
LARGE SCALE COPPER VAPOR LASER COMPUTER CONTROL SYSTEM
M. J. LaChapell, L. W. Spencer, and G. W. Coutts 15 May 1979 18 p Presented at Instr. Soc. of Am. Conf., Chicago, 22 Oct. 1979 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-82275; CONF-791005-6) Avail: NTIS HC A02/MF A01

High power pulse copper vapor laser systems consist of a master oscillator and numerous power amplifiers. Large systems used in laser isotope separation experiments require several automatic control systems. The rapid development of compact minicomputers over the past several years has enabled the implementation of sophisticated computer controlled copper vapor laser systems. Present systems provide automatic time synchronization and input power stabilization. Future systems will incorporate semi-automatic start-up capabilities. DOE

N80-25654# Sandia Labs., Albuquerque, N. Mex.
LASER HEATING OF A MOLECULAR GAS CHANNEL
J. N. Olsen and L. Baker Feb. 1980 24 p
(Contract EY-76-C-04-0789)
(SAND-80-0154) Avail: NTIS HC A02/MF A01

The first steps toward laser initiated discharge channels are outlined. The temperature and density changes which are to be expected with reasonable laser energies are determined. To this end, absorption cross sections were measured as a function of gas pressure, line tuning, and laser energy for NH3 and C2H4 gases. Based on these values a number of hydrodynamic simulations were performed with the CHARTB hydrocode which show that an efficient conversion of initial vibrational temperature into translational temperature occurs. Moreover, it is seen that the hydrodynamic motion is slow compared to reasonable relaxation times so that this efficiency is not unique to NH3 with its anomalously fast relaxation time. DOE

N80-25655# Los Alamos Scientific Lab., N. Mex.
EFFECT OF NONLINEAR REFRACTION ON BEAM BRIGHTNESS IN LASER FUSION APPLICATIONS
Claude R. Phipps, Jr., David E. Watkins, and Scott J. Thomas 1979 12 p refs Presented at the Lasers 1979 Conf., Orlando, Fla., 15-20 Dec. 1979
(Contract W-7405-eng-36)
(LA-UR-80-417; CONF-791220-5) Avail: NTIS HC A02/MF A01

The far-field brightness loss due to nonlinear refraction of a laser beam of finite transverse extent is a limitation for phase conjugation. Exact calculations are presented supported by measurements, for these effects in Gaussian beams. DOE

N80-25656# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
HIGH REPETITION RATE ELECTRO-OPTIC Q-SWITCHING OF Nd(3+):YAG LASERS SHOWING STRONG OPTICAL BIREFRINGENCE
Chen-Hsi Chang, Kurt Hirsch, and Hans Salzmann 1979 33 p refs Submitted for publication
(IPF-79-6) Avail: NTIS HC A03/MF A01

Using a configuration of two coupled resonators, electro-optic Q switching of CW pumped Nd(3+):YAG lasers was investigated. This technique yields two linearly polarized output beams with practically all the power contained in one beam. In the case of strong pumping, e.g., using high repartition rate flashlamp pumping, the optimization of mirror reflectivity leads to a single resonator configuration. As some applications make use of only one component of polarization, such as laser scattering diagnostics of thermonuclear plasmas, the usefulness of concentrating the available laser power into one linearly polarized output beam is shown. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N80-25657 Massachusetts Univ., Amherst.
FRICTIONAL DAMPING AT UNLUBRICATED METALLIC INTERFACES Ph.D. Thesis
Bharat Bhushan Aggarwal 1980 163 p
Avail: Univ. Microfilms Order No. 8012580

The contact of two nominally flat rough surfaces subjected to a constant normal load and a cyclic tangential load is investigated. The contact of two nominally flat rough surfaces with Gaussian peak height distributions is mathematically simulated by the contact of single equivalent tough surface with a rigid plane. An equivalent rough surface is a surface with a peak height distribution equal to the distribution of the sum of the peak heights of the original pair of rough surfaces and whose asperity curvature is the sum of the curvatures of the asperities in contact. The asperities on the equivalent rough surface are assumed to have spherical summits of equal radii. The mode of asperity deformation under normal load is assumed to be plastic. For tangential load, the tangential displacement of a contact spot on the interface is assumed to be the sum of the displacement of the center of contact due to plastic flow and the displacement of the center of contact due to the elastic displacement of the bulk of the asperity material. During load reversal the tangential displacement of the center of a contact spot is assumed to be elastic until a plastic flow condition is reached: the subsequent displacement is the sum of elastic and plastic displacements of the center or contact. Dissert. Abstr.

N80-25658 Houston Univ., Tex.
THE DYNAMIC ANALYSIS OF HIGH-SPEED FLEXIBLE CAM MECHANISMS Ph.D. Thesis
Sheng-Sheng David Young 1979 177 p
Avail: Univ. Microfilms Order No. 8012532

A theoretical study is presented on the dynamic behavior of high-speed, flexible cam mechanisms. A comparison study is presented of various dynamic models to establish conditions for the validity or regions of validity of these models. Then a parametric modeling error analysis is given to study the effect of modeling errors on the system responses and some easily used rules of thumb for the cam design are generated. In an effort to model more accurately the cam and follower system by a single degree of freedom system, a parameter identification technique utilizing an optimization algorithm is developed here. Furthermore, a new sensitivity analysis method using the eigenvector and eigenvalue derivatives with respect to system parameters is also presented in this dissertation. Finally, the presentation of cam mechanism separation using a retaining spring is thoroughly analyzed and some useful design information is generated. Dissert. Abstr.

N80-25659 Cincinnati Univ., Ohio.
FLY ASH EROSION IN GAS TURBINE MATERIALS Ph.D. Thesis
Rangnath Anandrao Kotwal 1979 165 p
Avail: Univ. Microfilms Order No. 8012237

Series of experiments were conducted to determine the resistance to erosion of 2024 aluminum, 6Al-4V titanium, 304 stainless steel, Rene 41 and INCO 718 alloys by samples of fly ash obtained form various power plants and also by several commercial abrasives. The effects of angle of attack, particle velocity, particle nature, particle size and target specimen temperature were investigated, and a semi-empirical relation was obtained which relates the erosive characteristics of fly ash to that of commercial abrasives. A simple computer program was developed to determine erosion loss on a material when the composition and particle size distribution of the fly ash are known. The computed erosion results are found to be in good agreement with the experimentally determined values. The computerized results show that the effect of fly ash composition is more significant for larger particles. High velocities and elevated temperatures also influence the effect of fly ash composition.
Dissert. Abstr.

N80-25660*# National Aeronautics and Space Administration. Pasadena Office, Calif.
HERMETIC SEAL FOR A SHAFT Patent Application
Frank Lombardi, inventor (to NASA) (JPL) Filed 30 May 1980 13 p
(Contract NAS7-100)
(NASA-Case-NPO-15115-1; US-Patent-Appl-SN-154725) Avail:

NTIS HC A02/MF A01 CSCL 11A

An hermetic seal for a linear rod with a portion projected axially through a port in a wall for a pressure chamber and supported for omnidirectional motion. The seal is characterized by a resilient, impervious, cylindrical body concentrically and integrally fixed to a shaft comprising a linear ordered array of annular flutes. A section integrally fixed to the wall of the chamber and concentrically related to the port comprises a second linear ordered array of annular flutes. A third section interposed between the first and second sections and integrally in coaxial alignment with them comprises an annular ordered array of linear flutes concentrically related to the shaft, which allows axial, angular, and pivoted motion of the rod. NASA

N80-25661*# AiResearch Mfg. Co., Torrance, Calif.

DESIGN STUDY OF TOROIDAL TRACTION CVT FOR ELECTRIC VEHICLES Final Report

A. E. Raynard, James Kraus, and Daniel D. Bell Jan. 1980 161 p refs

(Contracts DEN3-117; EC-77-A-31-1044)

(NASA-CR-159803; DOE/NASA/0117-80/1; Rept-80-16762) Avail: NTIS HC A08/MF A01 CSCL 13I

The development, evaluation, and optimization of a preliminary design concept for a continuously variable transmission (CVT) to couple the high-speed output shaft of an energy storage flywheel to the drive train of an electric vehicle is discussed. An existing computer simulation program was modified and used to compare the performance of five CVT design configurations. Based on this analysis, a dual-cavity full-toroidal drive with regenerative gearing is selected for the CVT design configuration. Three areas are identified that will require some technological development: the ratio control system, the traction fluid properities, and evaluation of the traction contact performance. Finally, the suitability of the selected CVT design concept for alternate electric and hybrid vehicle applications and alternate vehicle sizes and maximum output torques is determined. In all cases the toroidal traction drive design concept is applicable to the vehicle system. The regenerative gearing could be eliminated in the electric powered vehicle because of the reduced ratio range requirements. In other cases the CVT with regenerative gearing would meet the design requirements after appropriate adjustments in size and reduction gearing ratio. M.G.

N80-25662# Shaker Research Corp., Ballston Lake, N. Y.

ROTOR-BEARING DYNAMICS TECHNOLOGY DESIGN GUIDE. PART 4: CYLINDRICAL ROLLER BEARINGS Interim Report, 15 Apr. 1978 - Aug. 1979

A. B. Jones and J. M. McGrew, Jr. Wright-Patterson AFB, Ohio AFAPL Dec. 1979 74 p refs

(Contract F33615-76-C-2038; AF Proj. 3048)

(AD-A082355; SRC-79-TR-45; AFAPL-TR-78-6-PT-4) Avail: NTIS HC A04/MF A01 CSCL 13/9

This report is an update of the original Part 4 of the Rotor-Bearing Dynamics Design Technology Series, AFAPL-TR-65-45 (Parts 1 through 10). A computer program is given for preparation of cylindrical roller bearing stiffness data input for rotordynamic response programs. The complete stiffness matrix is calculated including centrifugal effects. Considerations such as elastohydrodynamic and cage effects are not included since they have little influence on the calculation of cylindrical roller bearing stiffness. The resulting program is reasonably small and easy to use. GRA

N80-25663# Naval Ordnance Station, Louisville, Ky.

EXPLOSIVELY JOINING DISSIMILAR METAL TUBES Final Report

Ted R. Marshall Nov. 1979 110 p refs

(AD-A082068; NOSL-MT-053) Avail: NTIS HC A06/MF A01 CSCL 13/8

This project was conducted to further develop the explosive cladding process and to use the process by joining pipes/tubes of metals that cannot be welded together by conventional methods. The project was diverted from the original plan to utilize a 'scarf-joint' transition joint of identical size pipes/tubes to development of a method of penetrating watertight bulkheads or decks with a pipe/tube having widely different properties. The emphasis was on penetrating aluminum bulkheads/decks with stainless steel pipes of sizes from 3/4 in. to 6 in. for surface effect ship application. GRA

N80-25664# Teesside Polytechnic, Cleveland (England). Dept. of Mechanical Engineering.

RELATION BETWEEN THE SURFACE FRICTION OF PLATES AND THEIR STATISTICAL MICROGEOMETRY M.S. Thesis. Interim Report, Apr. 1979 - Jan. 1980

M. J. King Jan. 1980 290 p refs

(Grant N00014-78-G-0059; NR Proj. 062-629)

(AD-A082758) Avail: NTIS HC A13/MF A01 CSCL 20/4

An attempt is made to relate the geometry of nominally flat surfaces to their resistance to fluid flow. The experimental work was carried out in an open flume, 20 meters in length, 30 cm wide, and 30 cm deep. The flow measurements were carried out over a range of free stream velocities from 35 cm/sec to 85 cm/sec. Hot film anemometry using a single sensor was used to measure the boundary layer velocity profile development along a 2.4 meter section of the channel floor which provides the base for the test surfaces. The velocity profiles are analyzed to determine the surface friction coefficient using the simplified momentum integral equation as well as the logarithmic inner law approach. The test surfaces, including a 4.8 meter long replica of a ship hull surface, were examined using a number of surface measurement instruments capable of recording surface wavelengths from microns to meters. Surface profiles were recorded and digitized and the data statistically analyzed to give an overall characterization of the surfaces under investigation using both amplitude and spatial parameters. GRA

N80-25665# Tribon Bearing Co., Cleveland, Ohio.

EVALUATION OF NEW MATERIALS FOR ROTOR HUB JOURNAL BEARINGS Final Report, Aug. 1976 - Nov. 1977

Donald W. Moyer Feb. 1980 23 p

(Contract DAAJ02-76-C-0060; DA Proj. 1F2-63209-DB-38)

(AD-A082444; USARTL-TR-78-39) Avail: NTIS HC A02/MF A01 CSCL 13/9

The nonlubricated bearing designs currently used in a number of helicopter rotor systems are based on a fabric-reinforced Teflon technology that is more than 10 years old. This test program was designed to evaluate some of the promising new self-lubricating materials and compare them to the present bearing design. These tests evaluated four new bearing materials plus two standard fabric reinforced Teflon bearings. Tests were conducted at normal flight loads and motions initially. The bearing loads were then increased in order to accelerate material deterioration and to reduce the required test time. GRA

N80-25666# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.

COMPACT CLOSED CYCLE BRAYTON SYSTEM FEASIBILITY STUDY, VOLUME 1 Final Report, 20 May 1976 - 20 Jun. 1979

R. E. Thompson, R. L. Ammon, R. Calvo, L. R. Eisenstatt, and F. R. Spurrier Aug. 1979 204 p refs

(Contract N00014-76-C-0706)

(AD-A081379; WAES-TNR-237-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 20/13

This report presents the final results from a three year study which evaluated the feasibility of a closed Brayton cycle power conversion system for compact light weight naval propulsion plants. The overall objective of the program was to conduct the analytical study and experimental research required to evaluate and to demonstrate feasibility of a closed Brayton cycle power conversion system for a low volume, light weight marine propulsion plant. Another objective was to insure relevance of power conversion system study results to all candidate applications, including recognition of the various energy sources which the Navy could desire to use in the future. The Compact Closed Cycle Brayton System (CCCBS) program has included derivation of the most stringent representative requirements for the CCCBS power conversion system, consideration of the interfaces with the ship and with other powerplant components which were outside the scope of the system under study, investigation and evaluation of the components which are most critical to feasibility, iterative definition of a reference 52.2 M Pa (17,000 HP) CCCBS design concept; extensive creep-rupture tests of candidate turbine

materials in helium and in air at 927 C (1700 F), and overall evaluations and assessments. The results have shown the feasibility and attractive characteristics of a CCCBS and have indicated that no high risk developments or technology breakthroughs are needed for the CCCBS power conversion system. The results of this program provide a valuable baseline of data for use by the Navy in defining the advanced powerplants which will enhance the capabilities of many types of naval vessels.
GRA

N80-25667# Bendix Corp., Kansas City, Mo.
MATHEMATICAL MODEL AND THE DYNAMIC SIMULATION OF AN ELECTROMECHANICAL ROTARY DEVICE
J. D. Emergy Feb. 1980 65 p refs
(Contract EY-76-C-04-0613)
(BDX-613-2376) Avail: NTIS HC A04/MF A01

A mathematical model of an electromechanical rotary device is presented. This device contains a rotor, stator, and two springloaded arms which restrict the rotor motion. The desired action is the alignment of the rotor and the consequent movement of the arms. The SLENOID computer program for calculating the magnetic torque, air gap permeance, spring torque, damping effects, and motion of the rotor and arms is described. DOE

N80-25668# California Univ., Livermore. Lawrence Livermore Lab.
CONTINUOUSLY VARIABLE TRANSMISSIONS: THEORY AND PRACTICE
Norman H. Beachley and Andrew A. Frank Aug. 1979 50 p refs Prepared in cooperation with Wisconsin Univ., Madison
(Contract W-7405-eng-48)
(UCRL-15037) Avail: NTIS HC A03/MF A01

The five basic principles that can be used in the design of continuously variable transmissions (CVT) for motor vehicles are examined and compared. These include: hydrostatic, traction drive (V-belt and rolling contact), overrunning clutch, electric, and multispeed gearbox with slipping cluth. Commercially available CVTs suitable for motor vehicles are discussed along with the research and development programs for CVTs. DOE

N80-25669# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
IMPROVING THE PERFORMANCE AND FUEL CONSUMPTION OF DUAL CHAMBER STRATIFIED CHARGE SPARK IGNITION ENGINES Final Report
S. C. Sorenson, S. S. Pan, J. J. Bruckbauer, and G. R. Gehrke Sep. 1979 294 p refs
(Contract EC-77-S-02-4493)
(COO-4493-5; UILU-ENG-79-4012) Avail: NTIS HC A13/MF A01

A specially constructed single cylinder engine was used to both conduct experiments to study mixing effects and to obtain experimental data for the validation of the computer model which was constructed. The effect of fuel injection timing on performance and emissions was studied using the combination of orifice size and prechamber to main chamber rate ratio which gave the best overall compromise between emissions and performance. In general, fuel injection gave slightly higher oxides of nitrogen, but considerably lower hydrocarbon and carbon monoxide emissions than the carbureted form of the engine. Experiments with engine intake port redesign to promote swirl mixing indicated a substantial increase in the power output fron the engine and, that an equilvalent power levels, the nitric oxide emissions are approximately 30% lower with swirl in the main chamber without swirl. DOE

N80-25670# Sandia Labs., Albuquerque, N. Mex. Combustion Applications Div.
COMPARISON OF IGNITION LOCATIONS IN A HIGH SWIRL ENGINE
J. Ray Smith Oct. 1979 32 p refs Presented at the Western States Sect./The Combust. Inst., Berkeley, Calif., 15-16 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-8715; CONF-791048-4) Avail: NTIS HC A03/MF A01

A comparison of the effect of different ignition locations on engine performance in a high swirl, homogeneous charge, spark ignition engine made using a focused laser as the ignition source. Using the indicated mean effective pressure (IMEP) as the performance indicater, the ignition location was varied from the center of the cylinder to the cylinder wall by moving the laser focusing lens. Fifty to one hundred millijoules of laser energy at 0.53 micron wavelength was required to give reliable ignition. The fuel was propane at an equivalence ratio of 0.8 at an engine speed of 1200 rpm. Whereas the spark location for optimum IMEP in a non swirl engine is typically the center, it was found that IMEP did not vary significantly with ignition location in the high swirl engine. This unexpected result was apparently due to the short burn durations achieved with a very high swirl at time of ignition. Although there appeared to be a slight decrease in induction time using a laser instead of spark plug, no significant difference in the rates of pressure rise were observed when the laser deposition energy was comparable to that of the spark plug. DOE

N80-25671# Oak Ridge National Lab., Tenn.
DIRECTIONS IN AUTOMOTIVE ENGINE RESEARCH AND DEVELOPMENT
Garland Samuels 1980 36 p Presented at WATTec 7th Ann. Energy Conf. and Exhibition, Knoxville, Tenn., 20 Feb. 1980
(Contract W-7405-eng-26)
(CONF-800212-2) Avail: NTIS HC A03/MF A01

The advent of high fuel costs and automotive fuel economy and emission regulations has cast doubt on the economic superiority and even the technical feasibility of conventional spark ignition and diesel engines, and has opened the field to other concepts. The emission regulations and their effect on the design and efficiency of conventional engines are reviewed, the research and development effort to improve the performance of conventional engines and to develop advanced engines is discussed, and the current status of these engines is presented. DOE

N80-25672# Combustion Electromagnetics, Inc., Lexington, Mass.
EFFECTS OF MICROWAVES ON THE PERFORMANCE OF INTERNAL COMBUSTION ENGINES Final Technical Report, 1 Mar. 1978 - 31 May 1979
M. A. V. Ward 30 Jun. 1979 99 p refs
(Contract ET-78-C-03-1865)
(SAN-1865-T1) Avail: NTIS HC A05/MF A01

The interaction of microwave energy with both an ignition plasma as well as with a hydrocarbon air flame plasma were studied. Lean mixture burn and increased flame speed of a hydrocarbon air fuel mixture in the internal combustion engine were also examined. Vehicular exhaust pollutants were reduced and engine efficiency was increased. DOE

N80-25673# Bettis Atomic Power Lab., West Mifflin, Pa.
FINITE ELEMENT ANALYSIS OF ARC WELDING
E. Friedman Jan. 1980 68 p refs
(Contracts EY-76-C-11-0014; DE-AC11-76PN-00014)
(WAPD-TM-1430) Avail: NTIS HC A04/MF A01

Finite element computer models of the gas tungsten arc welding process for determining the welding thermal cycle, weld bead shape, and penetration characteristics as well as for evaluating the stresses and distortions generated as a result of the temperature transients are described. The analysis procedures are applicable to planar or axisymmetric welds with arbitrary cross sectional geometries, under quasistationary conditions. The method used for determining temperatures features an iteration procedure to accurately account for the latent heat absorbed during the melting and liberated during solidificatiom of the weld. A quasistationary formulation for moving welds enables temperatures to be calculated using a two dimensional heat conduction computer program. The present limitation of high welding speed can, however, be relaxed without altering the two dimensional framework of the procedure. DOE

N80-25674# National Technical Information Service, Springfield, Va.
ELECTRON BEAM WELDING, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Feb. 1980
William E. Reed Mar. 1980 104 p Supersedes NTIS/PS-79/

0158; NTIS/PS-78/0184; NTIS/PS-77/0156 2 Vol. (PB80-805971; NTIS/PS-78/0156; NTIS/PS-78/0184; NTIS/PS-77/0156) Avail: NTIS HC $30.00/MF $30.00 CSCL 13H

Development, automation, and applications of electron beam welding are presented in these Federally sponsored research reports. Properties of electron beam welds and weldability of steel, aluminum, refractory metals, heat resistant alloys, and corrosion resistant alloys are included. This updated bibliography contains 97 abstracts, 17 of which are new entries to the previous edition. GRA

N80-25675/ National Technical Information Service, Springfield, Va.

ELECTRON BEAM WELDING, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1977 - Feb. 1980

William E. Reed Mar. 1980 185 p Supersedes NTIS/PS-79/0517; NTIS/PS-78/0186; NTIS/PS-77/0157 2 Vol. (PB80-805989; NTIS/PS-79/0157; NTIS/PS-78/0186; NTIS/PS-77/0157) Avail: NTIS HC $30.00/MF $30.00 CSCL 13H

Reports from worldwide research are cited covering the process, automation, equipment, and applications of electron beam welding. Properties and weldability of steel aluminum, titanium, refractory metals, and heat resistant alloys are included. This updated bibliography contains 178 abstracts, 37 of which are new entries to the previous edition. GRA

N80-25676/ National Technical Information Service, Springfield, Va.

DIESEL EXHAUST EMISSIONS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Jan. 1980

Diane M. Cavagnaro Feb. 1980 159 p Supersedes NTIS/PS-79/0037; NTIS/PS-78/0109; NTIS/PS-77/0104 (PB80-805385; NTIS/PS-79/0037; NTIS/PS-78/0109; NTIS/PS-77/0104) Avail: NTIS HC $30.00/MF $30.00 CSCL 13B

Aspects of exhaust gases from stationary and vehicular diesel engines are presented in these citations of Federally funded research. Pollution potential, composition, control, and formation processes in combustion reactions are included. The effects of achieving better fuel consumption on the types of exhaust gases formed are covered as well as research concerned with the health effects of these exhaust gases. This updated bibliography contains 152 abstracts, 45 of which are new entries to the previous edition. GRA

N80-25677/ National Technical Information Service, Springfield, Va.

DIESEL EXHAUST EMISSION CONTROL FOR MOTOR VEHICLES, VOLUME 1. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - 1977

Diane M. Cavagnaro Feb. 1980 213 p (PB80-805393) Avail: NTIS HC $30.00/MF $30.00 CSCL 13B

Research from worldwide journal literature on the control of exhaust gases from diesel motor vehicle engines is cited. Most studies are concerned with emission control through engine design; however, some studies cover the use of fuel additives for pollution control. This updated bibliography contains 206 abstracts, none of which is new to the previous edition. GRA

N80-25678/ National Technical Information Service, Springfield, Va.

DIESEL EXHAUST EMISSION CONTROL FOR MOTOR VEHICLES, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - Jan. 1980

Diane M. Cavagnaro Feb. 1980 110 p (PB80-805401; NTIS/PS-79/0038) Avail: NTIS HC $30.00/MF $30.00 CSCL 13B

Citation to worldwide research were selected that discuss the control of exhaust gases from diesel motor vehicle engines. Most of the studies are concerned with emission control through engine design; however, some studies also cover the use of fuel additives for pollution control. This updated bibliography contains 103 abstracts, 48 of which are new entries to the previous edition. GRA

N80-25679/ National Technical Information Service, Springfield, Va.

DIESEL EXHAUST EMISSIONS. CITATIONS FROM THE AMERICAN PETROLEUM INSTITUTE DATA BASE Progress Report, 1974 - Dec. 1980

Diane M. Cavagnaro Feb. 1980 204 p Supersedes NTIS/PS-79/0039 (PB80-805419; NTIS/PS-79/0039) Avail: NTIS HC $30.00/MF $30.00 CSCL 13B

This bibliography cites research reports concerning exhaust emissions from diesel motor vehicles. Topics include engine design, techniques of measuring gases, pollution control, and fuel additives. GRA

N80-25680/ National Technical Information Service, Springfield, Va.

GAS BEARINGS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report 1970 - Nov. 1979

Guy E. Habercom, Jr. Dec. 1979 328 p Supersedes NTIS/PS-78/1278; NTIS/PS-77/1123; NTIS/PS-76/0971 (PB80-802507; NTIS/PS-78/1278; NTIS/PS-77/1123; NTIS/PS-76/0971) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 13I

The design, performance, and applications of gas bearings are investigated in these reports gathered in a worldwide literature survey. Gas bearing configuration, gas flow lubrication, bearing load, and bearing stability are among the parameters reviewed. This updated bibliography contains 321 abstracts, 28 of which are new entries to the previous edition. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N80-25681/ Goodrich (B. F.) Co., Brecksville, Ohio. Research and Development Center.

EVALUATION OF NONDESTRUCTIVE INSPECTION METHODS FOR AIRCRAFT TIRES Final Report, Feb. 1978 - Aug. 1979

Donald D. Ewing Feb. 1980 153 p (Contract DOT-FA78WA-4103) (AD-A082523; FAA-RD-80-10; Rept-3AT04G3) Avail: NTIS HC A08/MF A01 CSCL 01/3

Advanced nondestructive (NDT) aircraft tire inspection systems were evaluated and compared with the air needle inspection technique normally used to qualify air carrier aircraft tires for repair, retread, and return to service. The advanced NDT inspection systems considered were: the air needle buffing; holographic; pulse echo ultrasound; and X-ray types. The equipment, inspection procedure, typical visual displays, and analysis techniques are described for each inspection system. Equipment state-of-art, tradeoffs, operator skills, required manning, and inspection rates are discussed. Basic equipment, installation, and maintenance costs are provided. The effectiveness of the inspection systems in detecting, identifying type and size, and locating the position of defects is reported for a group of four old defective tires and four new tires with built in defects which were inspected by all evaluated systems. Some potential advances in state-of-art are discussed. R.C.T.

N80-25682/ Claremont Mens Coll., Calif. Inst. of Decision Science.

ON PROBLEMS OF ESTIMATION FOR TWO PARAMETER DECREASING FAILURE RATE DISTRIBUTIONS APPLIED TO RELIABILITY

Janet M. Myhre and Sam C. Saunders Mar. 1980 39 p refs (Contracts N00014-78-C-0213; N00014-79-C-0755) (AD-A082991; Rept-80-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper some of the problems of parametric estimation for samples from distributions, which have decreasing failure rate, are discussed. Some of these distributions are obtained by mixing different exponential populations, others represent mechanisms analogous to 'work hardening' for each component where 'old is better than new'. Sufficient conditions are obtained that maximum likelihood estimators of appropriately chosen shape and scale parameters exist in both cases. The sample data which are available, when a decreasing failure rate distribution governs life, are usually censored with only a few failures observed; this limitation is dealt with. Actual data, obtained from the testing of integrated circuit electronic packages, are provided to illustrate these concepts and verify the applicability and usefulness of the techniques described. GRA

N80-25683# California Univ., Berkeley. Operations Research Center.

AN ADAPTIVE BAYESIAN SCHEME FOR ESTIMATING RELIABILITY GROWTH UNDER EXPONENTIAL FAILURE TIMES

Nozer D. Singpurwalla Dec. 1979 33 p refs Prepared in cooperation with Stanford Univ., Calif. and George Washington Univ., Washington, D.C.

(Grants AF-AFOSR-3179-77; DAAG29-77-G-0031; AF Proj. 2304)

(AD-A083006; ORC-79-17) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper we consider an adaptive approach for estimating reliability growth, based on prior information which is motivated from practical considerations. We discuss two situations: in the first one, both the prior distribution and the posterior distributions of the mean time to failure of an exponential distribution are stochastically ordered; in the second situation, the prior distribution is stochastically ordered with respect to the last posterior distribution. The former situation leads us to a procedure which is not fully Bayesian, and is therefore termed by us as 'pseudo Bayesian'. Since we do not know the properties of this pseudo Bayesian approach, we can best describe our work here as being a 'pseudo Bayesian scheme'. The second situation leads us to an approach which is fully Bayesian under certain assumptions. Our work in this general area of reliability growth is still in progress, and we invite the attention of other researchers to look into some of the problems that we have posed, and the questions that we have raised. GRA

N80-25684# Southeastern Center for Electrical Engineering Education, Inc., Orlando, Fla.

BAYESIAN RELIABILITY THEORY FOR REPAIRABLE EQUIPMENT Final Technical Report, 1 Jun. - 30 Sep. 1979

Theodore S. Bolis Feb. 1980 30 p refs

(Contract F30602-78-C-0148; AF Proj. 2338)

(AD-A083009; RADC-TR-80-30) Avail: NTIS HC A03/MF A01 CSCL 14/4

This report introduces an assumption called instantaneous resurrection which holds that a repaired equipment is returned to the state of an equipment of similar age which has not yet failed, rather than to the state of a new equipment. Under this assumption, the number of failures of an equipment in time t is a Poisson process with leading function - log R(t), where R(t) is the reliability function of the equipment. This fact can be used in the estimation of parameters of various prior distributions via the appropriate Poisson mixtures. The case of the two way truncated Gamma prior and its limiting forms is discussed in the report. GRA

N80-25685# Argonne National Lab., Ill.

DEVELOPMENT OF NONDESTRUCTIVE EVALUATION TECHNIQUES FOR HIGH-TEMPERATURE CERAMIC HEAT EXCHANGE COMPONENTS Quarterly Report, Oct. - Dec. 1979

Jan. 1980 25 p refs

(Contract W-31-109-eng-38)

(ANL/MSD/FE-80-1; QR-9) Avail: NTIS HC A02/MF A01

Nondestructive methods for testing ceramic components for high temperature heat exchangers are reported. The sensitivity of the ultrasonic bore side probe was demonstrated for detection of 125 micrometer deep circumferential EDM notches on ID and OD surfaces of sintered and siliconized tubes. The signal to noise ratios for the ultrasonic echoes are better than 10 to 1. Data were collected on the microprocessor controlled operation of the ultrasonic probe. Detection and recording of an EDM notch location was demonstrated. The acoustic microscope was modified to handle 30 MHz sound waves which improved the penetration ability of the sound in SiC tube walls. The modification resulted in less acoustic noise. The ability to detect a notch only 75 micrometers in width was demonstrated. DOE

N80-25686# Los Alamos Scientific Lab., N. Mex.

IMAGE PROCESSING APPLICATIONS IN NDE

Roger A. Morris 1980 11 p refs Presented at Soc. of Photo-Optical Instrumentation Engr., Los Angeles, 6-7 Feb. 1980 Sponsored by DOE

(LA-UR-80-172; CONF-800207-2) Avail: NTIS HC A02/MF A01

Most techniques for nondestructive examination (NDE) use visual imaging in one form or another and vary from holographic interferometry where displacements under stress are measured to the visual inspection of an object's surface to detect cracks after penetrant has been applied. The nondestructive and destructive testing of a product throughout its life cycle is described for the microballoon target used in the laser fusion program. The beads are mass produced by the millions and the first nondestructive test is to separate the obviously bad beads (broken or incomplete) from the good ones. The good beads are then inspected for sphericity and wall thickness uniformity. The microradiography of the glass, uncoated bead is performed on a specially designed low energy X-ray machine. The beads are mounted in a special jig and placed on a Kodak high resolution plate in a vacuum chamber that contains the X-ray source. The X-ray image is made with an energy less that 2 keV and the resulting images are then inspected at a magnification of 500 to 1000X. Some typical results are presented. DOE

N80-25687# Argonne National Lab., Ill.

APPLICATION OF RELIABILITY, MAINTAINABILITY, AND AVAILABILITY ENGINEERING TO SOLAR HEATING AND COOLING SYSTEMS

Prem S. Chopra and Ronald M. Wolosewicz 1980 7 p refs Presented at the Ann. Reliability and Maintainability Symp., San Francisco, 22-24 Jan. 1980

(Contract W-31-109-eng-38)

(CONF-800103-3) Avail: NTIS HC A02/MF A01

The reliability of solar hot water and heating systems is compared with that of conventional systems using block diagrams, failure modes and effects analysis, and fault trees. Although stand-alone solar-energy systems are not as reliable as conventional systems, the RMA of the combined solar and conventional system can be made comparable to currently available heating and hot-water systems. An availability matrix is presented that can be used to develop maintenance schedules that do not decrease the system's availability. Field data presented on operating solar heating and cooling systems indicate that these systems experience four major generic problems: freezing, leakage, controls, and collectors. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N80-25688 West Virginia Univ., Morgantown.

DYNAMIC RESPONSES OF A MULTI-LAYERED RECTANGULAR PLATE ON VISCOELASTIC FOUNDATION DUE TO MOVING LOADS Ph.D. Thesis

Cheng-jer Lin 1979 168 p

Avail: Univ. Microfilms Order No. 8012930

The investigation presents the formulation of a general equation of motion and its analytic and numerical solution for the determination of the dynamic deflections and stresses of a multilayered rectangular plate on viscoelastic foundation subject

to a constant force traveling at a constant velocity. Various combinations of simply-supported, clamped and free edge conditions of the plate are studied. The equation of motion is solved by expressing the deflection function of the plate and the moving load in the form of a double series of normal mode functions of two orthogonal plate strips diagonalizing the stiffness matrix and making use of the Laplace transformation method. The validity of general formulas developed is verified by reducing them into special cases for comparative studies with the published works. To illustrate the general methodology developed, three plates having SSSS, SSFF, and CCCC edge supports are studied. Computer programs newly developed, together with those commercially available subroutines are used, and the effects of some parameters are illustrated and briefly discussed.
Dissert. Abstr.

N80-25689 Michigan State Univ., East Lansing.
RESIDUAL STRESS FACTORS IN TORSIONAL FAILURE MODES OF INDUCTION-HARDENED STEEL AXLE SHAFTS Ph.D. Thesis
Stephen Adam Zayac 1979 150 p
Avail: Univ. Microfilms Order No. 8013822

A quantitative relation between surface residual stress and ultimate torsional strain of induction hardened SAE 1038 steel axle shafts was established experimentally. Two distinct failure modes were observed, a brittle mode, controlled by a maximum shear strain criterion, and a ductile mode, controlled by void coalescence. Residual stress measurements, obtained using a dual diffractometer technique prior to torsional testing, revealed that large local gradients exist in the surface residual stress distribution. Nevertheless, a mean residual stress level associated with each axle shaft and determined by an average of eight equispaced measurements on a transverse cross section was constant along the shaft except at the flange, where heat treatment conditions vary, and at the spline, where the material was severely cold worked. The angle of twist at failure increased as the compressive residual stress level increased and the failure mode was a function of this residual stress level. The residual stress level, and consequently the angle of twist at failure, can both be controlled by process selection and quench conditions.
Dissert. Abstr.

N80-25690 Case Western Reserve Univ., Cleveland, Ohio.
RELIABILITY OF STRUCTURAL SYSTEMS Ph.D. Thesis
Mark Robert Gorman 1980 386 p
Avail: Univ. Microfilms Order No. 8013839

Two aspects of the reliability of structural systems are investigated. The reliability of structural systems in performing satisfactorily all of the functions for which structures are designed is discussed. A risk model for structural systems is proposed. The model considers the load environments or hazards which act upon the structure and cause the structure to respond. This response may cause damage. Damage gives rise to undesirable consequences. The probability distribution of consequence F sub C(c) is used as a measure of risk by which alternative designs may be considered. The statistical moments of the ultimate resistance of redundant structural systems to static, proportional loading, are calculated from the statistical moments of the resistance of the component elements. The methods are directly applicable to two and three dimensional frameworks of either truss or rigid frame construction. Actual structure geometry is used, and the method can handle both brittle and ductile elements. The effect of correlation between element resistances is investigated.
Dissert. Abstr.

N80-25691 West Virginia Univ., Morgantown.
THEORETICAL AND PHYSICAL APPROACH TO LIGHT GAGE STEEL SHEAR DIAPHRAGMS Ph.D. Thesis
Hsin-Tien Huang 1979 261 p
Avail: Univ. Microfilms Order No. 8012925

This research was undertaken for the purpose of evaluating the performance of various types of steel deck, when used as a shear diaphragm in buildings. The principal contribution is the formulations of shear strengths and stiffness. The theoretical solution treats different shapes, thickness, lengths and types of panels, purlins, and fasteners and establishes general formulas for shear stiffness and shear strength. Design tables and figures are given for diaphragm stiffness and strength to account for various factors in common steel diaphragm installations currently being used. Standard evaluation forms for stiffness and strength for many deck profiles are presented. Design examples and the comparison of experimental to theoretical results from full-scale tests are shown. Also, load and resistance factor design (LRFD) method for the diaphragm and its fasteners is described and then applied to examples of practical design situations so that it may be used to establish necessary margins of safety as related to the quality of construction.
Dissert. Abstr.

N80-25692 Michigan State Univ., East Lansing.
PERMANENT DEFORMATION OF COHESIONLESS SUBGRADE MATERIAL UNDER CYCLIC LOADING Ph.D. Thesis
Rodney Ward Lentz 1979 232 p
Avail: Univ. Microfilms Order No. 8013768

The trend toward ever increasing axle loads on highway and airport pavements has led to the development of numerous methods of pavement design. All of these methods agree that, for flexible pavements, subgrades should not undergo significant volume change or permanent deformation under the application of traffic loads. Thus, parameters for characterizing permanent deformation of subgrade materials are required in each of these methods. Consequently, there exists a need for research in material characterization, particularly in development of simplified test procedures which will reduce the manpower, time and money required. A very simple and economical test procedure was developed to evaluate parameters of cohesionless subgrade soils. By this procedure, permanent strain in sand subjected to cyclic loading can be characterized using stress and strain parameters from the universally accepted static triaxial test. To develop the procedure duplicate samples were tested using both static triaxial apparatus and a closed loop electrohydraulically actuated cyclic triaxial system. The dynamic test results were normalized with respect to parameters obtained from the corresponding static triaxial test. The normalized cyclic principal stress difference showed a unique relationship to the normalized accumulated permanent strain. This relationship was found to be independent of moisture content, density, and confining pressure. Based on this finding a constitutive equation was developed which allows prediction of permanent strain after any number of load repetitions using only parameters obtained from a static triaxial test.
Dissert. Abstr.

N80-25693*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HEATING AND COOLING SYSTEM Patent Application
Leland Imig and Mickey R. Gardner, inventors (to NASA) Filed 30 Apr. 1980 13 p
(NASA-Case-LAR-12393-1; US-Patent-Appl-SN-145208) Avail: NTIS HC A02/MF A01 CSCL 20K

An apparatus capable of cyclic heating and cooling of a test specimen undergoing fatigue testing is disclosed. Cryogenic fluid is passed through a block clamped to the specimen to cool the block and the specimen. Heating cartridges penetrate the block to heat the block and the specimen to very hot temperatures. Control apparatus is provided to alternately activate the cooling and heating modes to effect cyclic heating and cooling between very hot and very cold temperatures. The block is constructed of minimal mass to facilitate the rapid temperature change thereof.
NASA

N80-25694# Saab-Scania, Linkoping (Sweden).
SOME ASPECTS ON IMPROVEMENTS OF A FIRST-ORDER DYNAMIC OPTIMIZATION ALGORITHM
Bernt Jaermark 1980 20 p refs
(SAAB-TN-AE-73) Avail: NTIS HC A02/MF A01

Several devices concerning improvement of a first order differential dynamic programming method are discussed. These were tested and appear to be useful on optimal flight trajectory applications. Some convergence difficulties are due to instability in the differential equations or different sensitivity in the control within different time intervals. In order to reduce these difficulties, steps are taken by way of special choice of the penalty term in an earlier established convergence control parameter technique. To obtain better accuracy and stability when approaching or when close to optimum solution, a simplified second order

algorithm is discussed. A first order method is suggested for free terminal time. R.C.T.

N80-25695# Saab-Scania, Linkoping (Sweden).
BUCKLING OF SANDWICH PANELS SUBJECTED TO AXIAL COMPRESSION, SHEAR FORCES AND LATERAL PRESSURES. PART 2: ANALYSIS
Sven Erik Larsson, Harald Bengtsson, and Sten Oeberg 1980 79 p refs
(SAAB-TN-Ae-72-Bt-2) Avail: NTIS HC A05/MF A01

The Aerospace Division of SAAB-SCANIA initiated in 1962 a comprehensive study on analysis and testing of sandwich panels subjected to combined in-plane and normal loading. The investigation was related to bonded panels with aluminum skins and aluminum honeycomb core. The purpose of the investigation was to develop and verify analysis methods applied in the stress and strength analysis of honeycomb panels used in aircraft primary structures. Author

N80-25696# Royal Aircraft Establishment, Farnborough (England).
THE CONCEPT OF EFFECTIVE STRESS APPLIED TO ELASTICITY AND TO VISCOPLASTICITY IN THE PRESENCE OF ANISOTROPIC DAMAGE
J.-L. Chaboche Feb. 1980 31 p refs Transl. into ENGLISH of "Le Concept de Contrainte Effective Applique a l'Elasticite et a la Viscoplasticite en Presence d'un Endommagement Anisotrope", Rept. ONERA-1979-77 ONERA, Paris, 1979 Presented to the 115th Euromech Congr., Grenoble, France, 19-22 Jun. 1979
(RAE-Lib-Trans-2039; BR74076; ONERA-1979-77) Avail: NTIS HC A03/MF A01

The complex problems posed by the anisotropy which affects both the elastic behavior and the viscoplastic behavior are discussed. It is shown how a damage tensor of the fourth order can be introduced through the concept of effective stress in order to take into consideration the effect of the damage on the elastic behavior, on the basis of results furnished by homogenization techniques. A three dimensional law of anisotropy is proposed for creep damage, introducing a minimum number of characteristic coefficients. The possibilities of this law are evaluated for the case of the traction torsion of thin tubes and are compared with previous formulations. R.C.T.

N80-25697# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
COMPUTER PROGRAM FOR ELASTIC ANALYSIS OF PIPING SYSTEMS WITH SPECIAL REFERENCE TO THE POWER PIPING CODE B31.1
Daniel vanLeeuwen Apr. 1980 37 p refs
(MT-135) Avail: NTIS HC A03/MF A01

The program CRIF-PIPE is a user oriented computer program designed to run on a minicomputer. It allows the user to model efficiently an arbitrary three dimensional piping system and analyze the stresses and flexibility of different situations of the system with regard to thermal and mechanical loading. The theoretical basis is an elastic linear finite element model of the pipeline with linearly varying bending moments. The finite element stiffness method is particularly suited to complex systems involving many anchors, closed loops, interconnecting branch lines, and intermediate and terminal full, or partial restraints. The calculated stresses are compared to allowable stress levels described by the American power piping code B31.1. Author

N80-25698# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik.
APPLICATIONS IN STRUCTURAL ANALYSIS
Oct. 1978 49 p refs Presented at UUA/E 7th SIG Symp. on Appl. in Struct. Anal., Nice, 2-4 Oct. 1978
(ISD-251) Avail: NTIS HC A03/MF A01

Two papers dealing with computer assisted structural analysis are given. The first reviews basic initial load concepts and their application to inelastic transient stress analysis for thermal and mechanical loading. The plastic and creep branches of the ASKA computer program system are discussed. The second paper covers the OPTIMA 1.0 program addition to ASKA. Structural design problems within stress displacement and fabrication limits are studied. For individual titles, see N80-25699 through N80-25700.

N80-25699# Stuttgart Univ. (West Germany).
INELASTIC TRANSIENT STRESS ANALYSIS FOR THERMAL AND MECHANICAL LOADING
J. S. Doltsinis and H. Wuestenberg *In its* Appl. in Struct. Anal. Oct. 1978 p 1-22 refs (For primary document see N80-25698 16-39)
Avail: NTIS HC A03/MF A01

The basic initial load concept is reviewed and its direct applicability to reversible thermal problems is shown. The incremental procedure for irreversible thermomechanical processes is discussed with emphasis on the finiteness of the time step in the calculation. Plasticity and creep are described as independent contributions to the inelastic behavior at elevated temperatures. In situations where effects of history-dependence and rate-dependence are simultaneously present, the viscoplastic approach is recommended. This can be achieved within the inelastic part of ASKA by activating either the existing plastic or the creep branches of the program. Two recent applications involving inelastic transient thermomechanical response are presented. First the stress analysis of a vessel for liquid zinc during the initial heating phase is demonstrated. In the second example, the limiting cases of the elastic and the elasto-plastic approach are compared with the assumed elasto-viscoplastic behavior of the rate-sensitive material. Author (ESA)

N80-25700# Stuttgart Univ. (West Germany).
STRUCTURAL LAYOUT WITH STRESS-DISPLACEMENT AND FABRICATION LIMITS
J. Buehlmeier and H.-P. Miejnek *In its* Appl. in Struct. Anal. Oct. 1978 p 23-47 refs (For primary document see N80-25698 16-39)
Avail: NTIS HC A03/MF A01

Structural optimization within a given system of loads, acting in assigned directions at specified points or specified regions of space, is examined. The computer program system, OPTIMA 1.0, a large-scale optimization package designed to conform with concepts, is introduced. The system combines energy methods and gradient methods of structural analysis. Examples of its application are given with results. Author (ESA)

N80-25701# Pennsylvania State Univ., University Park. Applied Research Lab.
VIBRATION OF CYLINDRICAL SHELLS, WITH AND WITHOUT RING STIFFENING M.S. Thesis, Mar. 1980
Eugene C. Eichelberger, Jr. 11 Jan. 1980 144 p refs
(Contract N00024-79-C-6043)
(AD-A082524; ARL/PSU-TM-80-03) Avail: NTIS HC A07/MF A01 CSCL 20/11

The dynamical response of two cylindrical shells, one with and one without ring stiffening, was investigated. The driving-point admittance was measured and compared with predictions using the mean-value admittance method. This method predicts the geometric mean of the response of a vibrator with respect to frequency and is useful in understanding the behavior of many complex structures. The basic computations involve the mode functions, mode masses, and the mode density. The measurements were in good agreement with the theory, and demonstrate that the mean-value admittance method is a practical means of predicting the vibrational response of shell structures to point excitation. GRA

N80-25702# ITT Electro-Optical Products Div., Roanoke, Va.
STUDY OF THE EFFECTS OF BENDING AND MICROBENDING ON GLASS FIBERS Final Report, 1 Oct. 1978 - 30 Nov. 1979
Frank I. Akers and Steven L. Mahurin 28 Nov. 1979 94 p
(Contract N00014-78-C-0852)
(AD-A081239; ITT-79-35-04B) Avail: NTIS HC A05/MF A01 CSCL 20/6

Single mode fibers are being used as media for acoustic sensors based on optical phase change detection. Deployment of this type of sensor requires the optical fiber to be tightly coiled around a small diameter mandrel. This tight coiling has been found to increase the fiber attenuation through bending and microbending loss mechanisms. As a result, ITT EOPD was

awarded contract N00014-78-C-0852 by the Office Naval Research, which allows for an investigation of mechanisms of optical losses in glass fibers under states of bending and microbending and a study of relationships between optical loss mechanisms and glass composition for development of low loss wide aperture fibers. Both high and low NA single mode fibers were fabricated using core compositions of SiO2/GeO2 and SiO2/P2O3. The fiber performs were fabricated both by the conventional one-step technique and also by a two-step rod-in-tube technique, in order to reduce waveguide imperfections. The fibers in this array of eight different fiber types were evaluated for attenuation while unstressed, attenuation when bent around a mandrel, and attenuation while subjected to microbends. While the low NA fibers of all types showed significant bend and microbend induced losses, the high NA fibers showed very induced losses. The one-step high NA germanosilicate core fiber exhibited negligible bending and microbending losses under all circumstances. The one-step high NA germanosilicate core fiber was selected for the jacket evaluation. When 30 m of high NA fiber were wrapped around an 8 mm mandrel, the resulting attenuation increase was less than 0.3 db. GRA

N80-25703# ITT Electro-Optical Products Div., Roanoke, Va.
STUDY OF DYNAMIC EFFECTS ON GLASS FIBERS Final Report, 1 Oct. 1978 - 30 Nov. 1979
Frank I. Akers, Steven L. Mahurin, and G. C. Salisbury 26 Nov. 1979 73 p
(Contract N00014-78-C-0880)
(AD-A081238; ITT-79-37-11) Avail: NTIS HC A04/MF A01 CSCL 20/6

The experimental effort expended during this contract has established that the attenuation of both low and high NA single mode fibers is insensitive to either low frequency dynamic tension or dynamic twisting. Evaluation of fibers with respect to dynamic bending showed that low NA single mode fibers were attenuated during the bending phase while the high NA fibers were unaffected. Coating materials having refractive indices either higher or lower than fused quartz were applied to single mode fibers and were found to have no effect on dynamic attenuation characteristics. No effects arising from dynamic interactions were found in that all attenuation effects observed during dynamic testing were explained on the basis of static twists, tension, or bendings. GRA

N80-25704# General Atomic Co., San Diego, Calif.
INCREMENTAL STRESS-STRAIN LAW FOR GRAPHITE UNDER MULTIAXIAL LOADINGS
Fu-kong Tzung Nov. 1979 33 p refs
(Contract DE-AT03-76ET-35300; Gen. Atomic Proj. 6400)
(GA-A-15573) Avail: NTIS HC A03/MF A01

An incremental stress-strain law for describing the nonlinear, compressible and asymmetric behavior of graphite under tension and compression as well as complex loadings is derived based on a dry friction model in the theory of plasticity. Stress-strain relations are defined by longitudinal-lateral strain measurements for specimens under uniaxial tension-compression. Agreements with experimentally determined curves from biaxial loading experiments are shown. Agreements in finite element computations using the present model with strain measurements for diametral compression and 4 point bend tests of graphite are also obtained. DOE

N80-25705# Battelle Pacific Northwest Labs., Richland, Wash.
COLLAPSE OF EXPERIMENTAL CAPSULES UNDER EXTERNAL PRESSURE
F. A. Simonen and R. J. Shippell, Jr. Jan. 1980 38 p refs
(Contract EY-76-C-06-1830)
(PNL-3165) Avail: NTIS HC A03/MF A01

Stress analyses and developmental tests of capsules fabricated from thick-walled tubing were performed for an external pressure design condition. In tests of AISI-1018 low carbon steel capsules, a significant margin was seen between yield and collapse pressure. However, the experimental yield pressures were significantly below predictions, essentially eliminating the safety margin present in the conservative design approach. The differences between predictions and test results are attributed to deficiencies in the plasticity theories commonly in use for engineering stress analyses. The results show that the von Mises yield condition does not accurately describe the yield behavior of the AISI-1018 steel tubing material for the triaxial stress conditions of interest. Finite element stress analyses successfully predicted the transition between uniform inward plastic deformation and ovalization that leads to catastrophic collapse. After adjustments to correct for the unexpected yield behavior of the tube material, the predicted pressure-deflection trends were found to follow the experimental data. DOE

N80-25706# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
FATIGUE OF WELDMENTS IN NUCLEAR PRESSURE VESSELS AND PIPING
M. K. Booker, B. L. P. Booker, H. B. Meieran, and J. Heuschkel Mar. 1980 94 p refs
(Contract W-7405-eng-26)
(NUREG-CR-1351; NRNL/NUREG-64) Avail: NTIS HC A05/MF A01

Current (ASME) Code fatigue design rules for nuclear pressure vessels and piping include no special considerations for weldments other than purely geometric factors. Research programs aimed at nonnuclear applications have found weldments to display fatigue behavior inferior to that of pure base material. Available information on fatigue of weldments relevant to nuclear pressure vessels and piping was reviewed and determined changes in the current design rules appear to be dictated by the available information. Information was obtained and summarized and stored in a computerized data management system to facilitate correlation of facts and development of conclusion. Significant areas where development of additional data would substantially increase the ability to judge the adequacy of the current ASME design rules include a better understanding of the relative importance of crack initiation and crack propagation to fatigue life; additional fatigue data for prototype commercial weldments, including cumulative damage; properties of repair welds; significance of reheat cracks; quantitative effect of Code-allowable weld defects and the effect of variable microstructure across the weld joint. DOE

N80-25707# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy.
HYDROGEN SULPHIDE STRESS CORROSION CRACKING IN MATERIALS FOR GEOTHERMAL POWER Final Report
A. R. Troiano, R. F. Hehemann, and J. A. Peterson Aug. 1979 91 p refs Prepared in cooperation with Armco Steel Corp., Middletown, Ohio
(Contract EY-76-S-02-2602)
(COO-2602-7) Avail: NTIS HC A05/MF A01

Two point bent beam, NACE tensile, C-Ring and DCB stress intensity type specimens were employed to examine a series of steels SSC resistance in the standard NACE solution and in several modifications pertinent to geothermal environments. Where direct comparisons were possible, the different types of tests qualitatively ranked the alloys in the same order. These steels all exhibit a 15 to 20 percent higher yield strength break-point at service temperatures near 300 to 450 F and/or at pH values approaching 7. Several versions of well head equipment type steels with adequate hardenability have demonstrated satisfactory SSC threshold stress values at adequate yield strengths. The austenitic stainless steels displayed the usual sensitivity to chlorides and cold work. Overaging of several of the age hardenable variety improved the resistance to SSC with only a moderate reduction in strength. Two ferritic stainless steels have shown a higher threshold stress than their commonly employed counterpart. Examination of C-ring specimens cut from commercially treated casing and tubing clearly indicated the advantages of a tempered martensitic and the very real potential for temper embrittlement. DOE

N80-25708# Sandia Labs., Livermore, Calif. Data Processing Div.
USERS MANUAL: SECONDARY DATA REDUCTION PROGRAMS FOR THE ECLIPSE S-200/230 SHOCK AND VIBRATION MEASUREMENT SYSTEMS
H. W. Swan Nov. 1979 43 p refs
(Contract EY-76-C-04-0789)
(SAND-79-8065) Avail: NTIS HC A03/MF A01

The manual describes the Eclipse secondary data reduction programs from the user's point of view. These secondary

processing routines manipulate the data in ways that are outside the scope of the primary reduction routines. These include logarithms, antilogarithms, and powers of data; polynomial smoothing, dividing and multiplying one data set by another, and scaling; combinations and separation; and others. DOE

N80-25709# Hanford Engineering Development Lab., Richland, Wash.

THE EFFECT OF CRACK LENGTH AND SIDE GROOVES ON THE DUCTILE FRACTURE TOUGHNESS PROPERTIES OF ASTM A533 STEEL

K. W. Carlson and J. A. Williams Jan. 1980 67 p refs

(Contracts EY-76-C-14-2170; DE-AC14-76FF-02170)

(NUREG-CR-1171; HEDL-TME-79-65) Avail: NTIS HC A04/MF A01

The ductile fracture toughness, J/sub Ic/, and tearing modulus, T, of ASTM A533, Grade B, Class 1 steel were evaluated by the unloading compliance method for determining J-R curves. These properties were measured for a matrix of 1T specimens in which the relative crack length, a/W, and the depth of side grooving were systematically varied to determine their individual effects. In addition, the applicability of an LVDT extensometer system was investigated for use in the unloading compliance method for J-R curve determination. DOE

N80-25710# Hanford Engineering Development Lab., Richland, Wash.

TENSILE PROPERTIES OF IRRADIATED AND UNIRRADIATED WELDS OF A533 STEEL PLATE AND A508 FORGINGS

J. A. Williams Jan. 1980 40 p refs

(Contracts EY-76-C-14-2170; DE-AC14-76FF-02170)

(NUREG-CR-1158; HEDL-TME-79-51) Avail: NTIS HC A03/MF A01

The tensile properties of welds of base metals ASTM A533, Grade B, Class 1 steel plate and ASTM A508, Class 1 forgings were evaluated in irradiated (3 to 21 x 10 to the 18 power/sq cm) and unirradiated conditions. Yield strength and ultimate strength both increased with increasing fluence, while small ductility losses were generally independent of fluence. Yield strength was found to be more sensitive to irradiation than ultimate strength for all welds. The strength and ductility responses to irradiation varied between the weld materials. These variations were attributed to differences in chemical constituents of the welds. DOE

N80-25711# Brown Univ., Providence, R. I. Div. of Engineering.

PLASTIC CREEP FLOW EFFECTS IN THE DIFFUSIVE CAVITATION OF GRAIN BOUNDARIES

A. Needleman and J. R. Rice Dec. 1979 69 p refs

(Contracts EY-76-S-02-3084; E(11-1)3084-74)

(COO-3084-74) Avail: NTIS HC A04/MF A01

The growth of cavities along grain interfaces was analyzed by the combined processes of grain boundary diffusion and plastic dislocation creep in the adjoining grains. It is shown that the coupling between the processes can be expressed in terms of a parameter L, which has the dimensions of length and which is a function of material properties, temperature and applied stress; L decreases with increasing temperature and stress and has values in the range of 0.25 to 25 microns for various pure metals when stressed to 0.001 shear modulus at 0.5 T/sub m/. The contribution of dislocation creep to the cavity growth rate is shown to be negligible when L is comparable to or larger than the cavity spacing, but significant interactions occur, leading to growth rates very much in excess of those predicted on the basis of boundary diffusion alone, when L is comparable to or smaller than the cavity size. The coupling occurs because extensive dislocation creep allows local accomodation of matter diffused into the grain boundary from the cavity walls. The cavity growth rate is analyzed by formulating a new variational principle that governs combined processes of grain boundary diffusion and nonlinear viscous creep, and by implementing this principle through the finite-element method to obtain numerical solutions. DOE

N80-25712# Argonne National Lab., Ill. Materials Science Lab.

MEASURED RESIDUAL STRESSES IN TYPE 304 STAINLESS STEEL PIPING BUTT WELDMENTS

W. J. Shack and W. A. Ellingson 1980 30 p refs Presented at Seminar on Countermeasures for BWR Pipe Cracking, Palo Alto, Calif., 22-24 Jan. 1980

(Contract W-31-109-eng-38)

(DOE/TIC-11126) Avail: NTIS HC A03/MF A01

Residualstress measurements on Type 304 stainless steel Schedule 80 4, 10, and 26 in. pipe weldments are presented. Both strain-gauge and X-ray diffraction techniques were used. The bulk of the measurements were made on the inner surface, since these stress levels presumably control the initiation of intergranular stress-corrosion cracking. Complete stress profiles were obtained through the thickness of the pipe wall, since the through-wall distribution controls the growth of a crack once it has initiated. DOE

N80-25713# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.

MICROCRACK TECHNOLOGY Progress Report, 1 Apr. 1979 - 29 Feb. 1980

Gene Simmons, Louis Caruso, Elaine Padovani, Steven Sirey, Jeffrey Mann, Thomas Wissler, and Ann Harlow Mar. 1980 62 p refs

(Contract DE-AC02-78ER-04972)

(DOE/ER-04972/2) Avail: NTIS HC A04/MF A01

Microcracks in samples of core from a 3000 foot hole in the Conway granite, near North Conway, New Hampshire, are abundant and most of them are sealed with siderite, chlorite, quartz, hematite, clay, or microbreccia. The sealed cracks are 1 to 100 microns wide, intersect many grain boundaries, often coincide with grain boundaries, and both intersect and contain minerals that are normally rich in U and Th. The abundances of U and Th in 100 gm bulk samples range from 0.1 to 30 ppM and from 6 to 100 ppM, respectively. The working hypothesis that U and Th have migrated through the microcracks in CO2-rich waters is proposed. In the Redstone Quarry core, the presently open microcracks are preferentially oriented; most open cracks have horizontal surfaces. Samples of Devonian shales were obtained for the purpose of examining microcracks in relation to the production of natural gas. The problems of sample preparation for fissile shale were largely solved. Samples from the NTS were prepared for the examination of microcracks in relation to possible disposal sites for radioactive waste. DOE

N80-25714# California Univ., Livermore. Lawrence Livermore Lab.

DYNAMIC, INELASTIC BUCKLING ANALYSIS OF MARK 1 TORUS SUPPORT COLUMNS

Brian J. Benda Sep. 1979 62 p refs

(Contracts W-7405-eng-48; NRC-FIN-A-0213)

(NUREG-CR-1038; UCRL-52723) Avail: NTIS HC A04/MF A01

Columns that support the Mark I BWR containment tori are subjected to short-duration dynamic loads during some accident conditions. To accurately predict the actual response under these conditions, an analysis must incorporate the dynamic behavior of the columns. Two different analysis methods were used in an effort to solve this dynamic, inelastic buckling problem. Neither method adequately solved the problem. The finite element approach gave unstable results for short-duration dynamic load pulses. The finite difference approach did not incorporate the plasticity effects needed to accurately predict column response. Results that were obtained, however, indicated that little additional load capacity could be realized for the combinations of dynamic and static loads, and for the column configurations considered. The results presented indicate that design modifications will be required either to reduce the magnitude of the dynamic load or to increase the strength of the torus support columns. DOE

N80-25715# Laboratoire Central des Ponts et Chaussees, Paris (France). Service de Physique.

THE APPLICATION OF HOLOGRAPHY TO STRESS ANALYSIS

J.-M. Caussignac Oct. 1978 70 p refs In FRENCH; ENGLISH summary

(LPC-84) Avail: NTIS HC A04/MF A01

A synthesis of stress analysis results obtained with holo-

graphic interferometry is presented. The nondestructive tests were performed on scale models of civil engineering structures such as highway bridges and pavement. The holographic method is explained and the quantitative results are presented.
Author (ESA)

N80-25716# Laboratoire Central des Ponts et Chaussees, Paris (France). Dept. des Betons et Metaux.
STABILITY, TOUGHNESS, AND CRACK PROPAGATION IN STEEL WIRES AND BARS Ph.D. Thesis - Paris VI Univ.
A. Athanassiadis Sep. 1979 84 p refs In FRENCH; ENGLISH summary
(LPC-89) Avail: NTIS HC A05/MF A01

The calculation of the fracture parameters of a plane defect (transverse surface crack) for a given stress, when the specimen sustains a tension, a pure bending, or a uniform lateral loading is presented. Steel is assumed to be an elastic medium for which the stress intensity factor K sub I varies along the crack front. For several forms and sizes of cracks, the parameters K sub I and G were calculated by means of a tridimensional program based on the boundary integral equations method. For determining the two fracture parameters, two approaches were made using either displacements or potential energy followed by a check of the consistency of the two methods. The K sub I variation along the crack front versus its geometry and the most probable progressive evolution of the defect, and the energy release rate variation versus its geometry, to determine the critical defects and the stability of existing defects in front of brittle fracture, were also calculated.
Author (ESA)

N80-25717# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.
LINEAR-ELASTIC AND ELASTIC-PLASTIC FRACTURE MECHANICS OF STRUCTURAL MATERIALS Thesis - Karlsruhe Univ.
Dietrich Munz Jul. 1979 250 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-649)
(DFVLR-FB-79-31; ESA-TT-649) Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 36,70

Methods used to describe linear elastic and elastic-plastic fracture mechanics are summarized. Results of measurements on aluminum and titanium alloys, and steels are used to discuss problems relating to the measurement, assessment, and range of application of the various characteristic parameters. It is shown that the applicability of linear elastic fracture mechanics is larger than was previously assumed. The J-integral method is emphasized.
Author (ESA)

N80-25718# European Space Agency, Paris (France).
MECHANICAL MODELING OF MICROSTRUCTURAL INSTABILITIES IN CYCLIC VISCOPLASTICITY AT VARIABLE TEMPERATURES Ph.D Thesis
Georges Cailletaud Mar. 1980 111 p refs Transl. into ENGLISH of "Modelisation Mecanique d'Instabilites Microstructurales en Viscoplasticite Cyclique a Temperature Variable", Rept. ONERA-NT-1979-6 ONERA, Paris, 1979 Original report in FRENCH previously announced as N80-23445
(ESA-TT-611; ONERA-NT-1979-6) Avail: NTIS HC A06/MF A01

Constitutive equations, in the framework of thermodynamics with internal variables, using phenomenological observations, are proposed and identified by tests involving isolated temperature changes. The model is successfully compared with simple tests and is used to predict the behavior of the material under study when simultaneously subjected to mechanical and thermal cycling.
Author (ESA)

N80-25719*# New Mexico Univ., Albuquerque. Technology Application Center.
FATIGUE TESTING MACHINES. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Jan. 1980
Peter Moore Feb. 1980 36 p Sponsored by NASA and NTIS
(NASA-CR-162943; PB80-804057) Avail: NTIS HC $30.00/MF $30.00 CSCL 14B

Fifty-one abstracts from the international literature relate to the design, operation, and performance of fatigue testing machinery, including control systems, components, and diagnostic equipment. Application to metals, alloys, composites, and polymers under conditions varying from cryogenic to high temperature, and vacuum to greater than 1000 MPA is described. Types of fatigue investigated include those due to thermal and corrosion stresses, as well as stresses arising from fretting, flexure, and impact.
GRA

N80-25490# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CYCLIC PLASTIC DEFORMATION FOLLOWER
Georges Baudin *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 75-76 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 341-343 Original report in FRENCH previously announced as A80-12358 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

N80-25491# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
HARMONIC EXCITATION OF MECHANICAL SYSTEMS AT HIGH FREQUENCIES AND LARGE ACCELERATORS
Henri Loiseau *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979 1979-5 (ESA-TT-613) 1979 p 79-84 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 345-348 Original report in FRENCH previously announced as A80-12359 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

N80-26259# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
VARIATIONAL FORMULATION OF THE PLATE EQUILIBRIUM PROBLEM. APPLICATION TO ISOPARAMETRIC FINITE ELEMENTS OF PLATES, PART 1
Daniel Osmont and Raoul Girard *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 55-67 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 387-394 Original report in FRENCH previously announced as A80-19991 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N80-25720 International Institute for Applied Systems Analysis, Laxenburg (Austria).
HYDROLOGICAL AND ECOLOGICAL MODELS OF SHALLOW LAKES AND RESERVOIRS
Sven E. Joergenson, ed. (Roy. Dan. School of Pharm.) Oct. 1979 170 p refs Presented at IIASA Workshop, Laxenburg, Austria, 11-14 Apr. 1978
(IIASA-CP-78-14) Copyright. Avail: Issuing Activity

Twelve papers covering various aspects of modeling hydrophysical and ecological characteristics of shallow bodies of water are presented. Among different model types, stoichiometric models are compared to element cycle ones. The ecosystem and eutrophication models are shown to be of special interest. The role of phosphorus controlled chemical reactions in shallow water

and sediments is discussed. Ecological variables, such as algae, phytoplankton, and fish populations, affecting water quality are emphasized. Mathematical as well as data collection and processing problems are also considered. For individual titles, see N80-25721 through N80-25732.

N80-25721 International Institute for Applied Systems Analysis, Laxenburg (Austria).
DISCUSSION OF QUESTIONS RELATED TO HYDROPHYSICAL AND ECOLOGICAL MODELING OF SHALLOW LAKES AND RESERVOIRS
G. vanStraten *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 5-45 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

Problems encountered in the mathematical modeling of ecosystems based on shallow lakes and reservoirs are discussed. Element cycle models are shown to be better than constant stoichiometric models, especially when leading to a eutrophication model. In the description of nutrient uptake rates, it is necessary to include phytoplankton, algae, and fishes. Blue green algal bloom is of special importance. The selection of the necessary number of state variables is considered. Conditions necessary to modeling the hydrodynamics of lake circulation (equations of motion, wind stress, eddy diffusivity, Coriolis effects) are also considered. Author (ESA)

N80-25722 International Institute for Applied Systems Analysis, Laxenburg (Austria).
THE ROLE OF IRON AND CALCIUM IN THE CYCLING OF PHOSPHATES IN SHALLOW LAKES
L. Lijklema and A. H. M. Hisltjes *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 49-58 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

The cycling of phosphates between sediments and overlying water is discussed in relation to the overall process of eutrophication. The role of inorganic phosphates, particularly iron and calcium compounds is emphasized. Some of the main connections between primary productivity and associated decay processes, as well as the transformation and transport of phosphates, are illustrated. Results point to phosphates as a key element in determining water quality from the interrelation between physical, chemical, and biological processes in surface waters. Author (ESA)

N80-25723 International Institute for Applied Systems Analysis, Laxenburg (Austria).
THE PREDICTION OF SOLUTIONS TO MANAGEMENT AND ENGINEERING PROBLEMS RELATED TO THE EUTROPHICATION OF BODIES OF WATER
V. A. Vavilin, V. B. Vasilyev, M. Y. Tsitkin, and S. V. Bagotskii *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 59-64 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

The eutrophication of bodies of water is a typical example of a long term process that requires predictive estimation. Various natural conditions contribute to the sharp changes that occur in aquatic ecosystems. These conditions are the duration of the warm summer season, the illumination and shallowness of the water (having a warming effect), little circulation of the water, and the lack of a restraining influence from other factors on algal and biotic production processes. Two groups of dynamic models for predicting the eutrophication rates in waste disposal ponds are discussed. These are small models considering a small number of internal links and external impacts, and large models with a considerable number of variables, internal links, and external impacts. Author (ESA)

N80-25724 International Institute for Applied Systems Analysis, Laxenburg (Austria).
TWO EXAMPLES OF THE USE OF HYDRODYNAMIC MODELS IN ECOLOGICAL STUDIES
J. F. Paul *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 65-78 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

To demonstrate the use of hydrodynamic models in ecological studies, two extremes cases are described. In the first case, the solution of the complete three dimensional hydrodynamic equations is required in order to describe the current pattern adequately. In the second, no equations need be solved in order to describe the pertinent processes. These two examples illustrate that the degree of hydrodynamic detail is dependent upon the particular problem under investigation. The first example involves a study to determine the vulnerability of yellow perch larvae, spawned at different locations in western Lake Erie, to possible entrainment at the water intake from the Detroit Edison Monroe power station. The second, which does not require a solution of the hydrodynamic equations, is an investigation into the occurrence of taste and odor problems in the water supply at the Saginaw-Midland water intake station at Whitestone point on Saginaw Bay, Lake Huron. Author (ESA)

N80-25725 International Institute for Applied Systems Analysis, Laxenburg (Austria).
THE MODELING OF AQUATIC ECOSYSTEMS OF SHALLOW LAKES EXCHANGING MATTER WITH SEDIMENT AND WITH NEIGHBORING BODIES OF WATER
P. Mauerberger *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 79-90 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

Seventeen chemical and biological components can be considered by this cascade model which has an arbitrary number of horizontally arranged compartments. The model represents the energy fluxes in the ecosystem, stoichiometric cycling of the nutrients phosphorus and nitrogen, horizontal inflows and outflows of chemical and biological components into/out of the segments, vertical exchange of nutrients and particulate organic matter between sediment and water, solar radiation, water temperature, wind and external loadings by nutrients and organic matter. Oxygen saturation of the whole water body is used. The influence on the model of fish and benthic components, time lag between the release of nutrients by organisms and the subsequent reuse by primary producers, and calculations of the hydrodynamic transport processes by a separate simple model are shown as well. The model is verified using data obtained along the Baltic Sea coast as well as data from the Grosser Mueggelsee, Germany. Author (ESA)

N80-25726 International Institute for Applied Systems Analysis, Laxenburg (Austria).
DEVELOPMENT AND VERIFICATION OF A MODEL FOR PREDICTING EUTROPHICATION TRENDS IN CZECHOSLOVAKIA
M. Straskraba *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 91-96 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

Some theoretically sound and empirically verified relationships relevant to eutrophication problems are examined using an ecological simulation model. A shallow lake is defined as a lake with no permanent temperature stratification. According to an empirical relationship observed for different sets of temperature lakes, the mixing depth is related to the surface dimensions of the lake as characterized by the maximum length, effective length, or, more precisely, the fetch size. The empirical relationships imply that a lake with a maximum depth of a few meters will be deep if small, whereas a large lake with a depth of 220 meters will be shallow. In order to compare model runs with observed trends an automatic program was used on a Hewlett-Packard 9810 calculator and on a IBM 370 computer, each time for one year simulations. Results show that the increase in mixing depth as the dimensions of the lake increase causes a hyperbolic decrease in the photosynthesis activity of plankton, and consequently of the chlorophyll concentration. Author (ESA)

N80-25727 International Institute for Applied Systems Analysis, Laxenburg (Austria).
THE MODELING OF NUTRIENT EXCHANGE BETWEEN SEDIMENT AND WATER
G. Jolankai *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 97-99 ref (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

An aquatic ecosystem (eutrophication) model which represents nutrient uptake rates in the form of a time series is described. Data show that in shallow lakes this nutrient exchange process between the sediment and water is a time-varying phenomenon, or rather, it varies according to meteorological factors, such as wind velocity and wind induced fluid motion. The bottom sediment is stirred up occasionally by intensive wind and wave action, which causes the sediment particles and the adsorbed nutrients to be entrained, and which allows dissolved interstitial nutrients to enter the water. The limiting effects on eutrophication of water pollution, as well as their modeling, are also covered.
Author (ESA)

N80-25728 International Institute for Applied Systems Analysis, Laxenburg (Austria).
SIMULATION MODEL OF AN OLIGOTROPHIC LAKE
J. M. Svirezhev, N. K. Luckyanov, and D. O. Logofet *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 100-106 (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

A set of computer runs was made to test a model of an oligotrophic lake having a given, limited amount of nutrients. The initial values of the living components were obtained from a study of Lake Onega while the dynamic behavior of ecosystem components was investigated at a constant temperature. The simulated dynamics of algae, zooplankton, and bacterioplankton are shown. The dynamics of the main biological components at a temperature of 15 C are given. The results of the runs appear to give a qualitatively correct representation of the main ecological processes occuring in the oligotrophic lake. Author (ESA)

N80-25729 International Institute for Applied Systems Analysis, Laxenburg (Austria).
EVALUATION OF AVAILABLE PHOSPHORUS MODELS
M. W. Lorenzen and F. M. Haydock *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 107-129 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

The available models that can be used to analyze the effectiveness of possible options for controlling phosphorus loading are evaluated. Methods to compute phosphorus loading rates are reviewed. Land use loading rates and the data base created as part of the National Eutrophication Survey are discussed. Available lake response models for phosphorus are then considered. Three groups of models are studied: one box/one parameter, two box/one parameter, and two box/two parameter. It is shown that the selection of the specific procedures to be used as part of the evaluation of the impact of phosphorus control options is constrained by a number of factors. The large number of lakes to be used as a data base requires a relatively simple approach. The time scale of interest requires a method that can be applied to predict years into the future. The type of control options and specific effects on loading rates requires a tool that considers the direct result of the control. Author (ESA)

N80-25730 International Institute for Applied Systems Analysis, Laxenburg (Austria).
THEORETICAL INVESTIGATIONS INTO THE DEVELOPMENT OF AN INTENSIVELY USED SHALLOW LAKE WITH A RIVER FLOWING INTO IT
K. Bauer *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 130-136 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

By using correlation theory, which forms part of stochastic processes theory, to evaluate available data, some interesting effects related to the evolution of a shallow lake ecosystem are shown. The shallow lake considered is the Grosser Mueggelsee, which forms a part of the water system subordinated to the management district of the capital of the GDR, Berlin. Although daily and weekly data of ecosystem components and chemical pollutants have been measured over a period of 32 years, changes in the composition of phytoplankton species were not considered. Results show, for all components of the ecosystem, low frequency one year variations. For longer time series of the variables water temperature, oxygen, suspended matter, chloride, chemical oxygen demand, and carbonate hardness an assessment is made on the basis of monthly means taken during the period from 1945 to 1977. Results are cited in support of recommendations for improving water quality. Author (ESA)

N80-25731 International Institute for Applied Systems Analysis, Laxenburg (Austria).
EUTROPHICATION MODELING EFFORTS FOR LAKE BALATON
P. Csaki, J. Fischer, L. Hajdu, and G. Jolankai *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 137-149 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

Problems encountered in constructing an ecosystem and hydrology model of Lake Balaton are discussed. The model, intended for use as a control tool in water management, must describe the eutrophication process with reasonable accuracy, allow an identification of nutrient inputs and nonpoint pollution sources, and work within the constraints of available data bases. After an examination of these modeling criteria, the principal modeling problem is summarized as that of selecting one appropriate approach from the many that are available.
Author (ESA)

N80-25732 International Institute for Applied Systems Analysis, Laxenburg (Austria).
USE OF CHLOROPHYLL/SECCHI DISK RELATIONSHIPS
M. W. Lorenzen *In its* Hydrol. and Ecol. Models of Shallow Lakes and Reservoirs Oct. 1979 p 150-153 refs (For primary document see N80-25720 16-43)
Copyright. Avail: Issuing Activity

For high concentrations of phytoplankton, reductions in their concentration produce little change in transparency. However, the implication that for low phytoplankton concentrations changes in their concentration would produce large changes in transparency is not necessarily true. A regression equation for obtaining chlorophyll-a Secchi Disk depth values is given. Next, a theoretical analysis illustrating the importance of the extinction coefficient for factors other than algae is presented. Results show that the use of observed data for chlorophyll-a Secchi Disk obtained from lakes other than the one under study can give misleading projections. It is suggested that the value of the extinction coefficient should be obtained for the lake being studied. An analysis to estimate the effects of changed chlorophyll on transparency is then more likely valid. Author (ESA)

N80-25733*# Geological Survey, Denver, Colo.
GEOLOGIC APPLICATION OF THERMAL-INERTIA MAPPING FROM SATELLITE Progress Report, Dec. 1979 - Feb. 1980
Terry W. Offield, Principal Investigator, Susanne H. Miller, and Kenneth Watson Feb. 1980 3 p Sponsored by NASA HCMM
(EB0-10151; NASA-CR-163168) Avail: NTIS HC A02/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N80-25734*# California Univ., Berkeley. Space Sciences Lab.
REMOTE SENSING ANALYSIS OF WATER QUALITY AND THE ENTRAPMENT ZONE IN THE SAN FRANCISCO BAY AND DELTA Final Report, 15 Mar. 1978 - 14 Aug. 1979
Robert N. Colwell, Allen W. Knight, Principal Investigators, and Siamak Khorram 14 Aug. 1979 40 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NsG-5256)
(EB0-10152; NASA-CR-163169; SSL-Ser-20-Issue-42) Avail: NTIS HC A03/MF A01 CSCL 13B

The author has identified the following significant results. Data from an ocean color scanner flown on a U-2 aircraft at 65,000 ft and from LANDSAT MSS were enhanced to identify biologically active areas of San Francisco Bay, and to determine the salinity, turbidity, chlorophylls, and suspended solids. The best fit regression models for mapping water quality parameters were based on bands 3, 5, 7, and 10. Comparision of the results indicate that chlorophyll concentrations can best be estimated by the OCS or MSS data. Salinity can best be estimated by OCS data; turbidity can best be estimated by LANDSAT data.

Neither OCS nor MSS data provide reliable basis for estimating suspended solids. Aerial photography of the highest quality taken with either conventional color or infrared-sensitive color films was unable to locate the biologically active areas.

N80-25735*# Mississippi State Univ., Mississippi State.
APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS Semiannual Progress Report, 1 Nov. 1979 - 30 Apr. 1980
W. Frank Miller, Bradley D. Carter, Nancy Freeman, Jimmy L. Solomon, and Sidney G. Williams, Principal Investigators 1 May 1980 133 p refs ERTS
(Grant NGL-25-001-054)
(E80-10153; NASA-CR-163170; SAPR-13) Avail: NTIS HC A07/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-25736*# Telespazio, S.p.A., Rome (Italy).
AN AUTOMATIC CLASSIFICATION METHOD FOR LANDSAT DATA AS RESULTING FROM DIFFERENT EXPERIENCES IN THE ITALIAN ENVIRONMENT
Angelo Zandonella, Principal Investigator 1979 15 p refs Presented at the 2nd Congr. Nazl. sul Telerilevamento delle Risorse Terrestri, Varenna, Italy, 1979 Sponsored by NASA ERTS
(E80-10160; NASA-CR-163176) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-25737*# Columbia Univ., New York. Dept. of Geography.
APPLICATION OF DIGITAL ANALYSIS OF MSS DATA TO AGRO-ENVIRONMENTAL STUDIES Final Report
Robert A. Lewis and Samuel N. Goward, Principal Investigators 1 Mar. 1980 14 p ERTS
(Grant NsG-5080)
(E80-10161; NASA-CR-163178) Avail: NTIS HC A02/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-25738*# Stanford Univ., Calif. Dept. of Geology.
HCMM: SOIL MOISTURE IN RELATION TO GEOLOGIC STRUCTURE AND LITHOLOGY, NORTHERN CALIFORNIA
Ernest I. Rich, Principal Investigator 21 Apr. 1980 2 p HCMM
(Contract NAS5-24479)
(E80-10163; NASA-CR-163180) Avail: NTIS HC A02/MF A01 CSCL 08M

The author has identified the following significant results. Empirical observations on the ground and examination of aerial color IR photographs indicate that in grassland terrain, the vegetation overlying sandstone tends to become less vigorous sooner in the late spring season than does the area overlain by an adjacent shale unit. The reverse relationship obtains in the fall. These relationships are thought to be a reflection of the relative porosity of each of the units and hence of their ability to retain or lose soil moisture. A comparison of the optically enlarged day and nite IR imagery of the Late Mesozoic interbedded sandstone and shale units along the western margin of the Sacramento Valley, California, taken at seasonally critical times of the year (late spring/early summer and late fall/early winter) reveals subtle seasonal variations of graytone which tend to support the empirical observations after consideration of Sun angle and azimuth, and the internal consistency of the data on each set of satellite imagery.

N80-25739*# Bern Univ. (Switzerland). Dept. of Geography.
TOPOCLIMATOLOGICAL AND SNOWHYDROLOGICAL SURVEY OF SWITZERLAND Progress Report
Matthias Winiger, Principal Investigator Apr. 1980 6 p Sponsored by NASA HCMM
(E80-10164; NASA-CR-163181; PR-2) Avail: NTIS HC A02/MF A01 CSCL 08L

The author has identified the following significant results. Low temperature zones depend on the topography and the terrain coverage type (besides the meteorological situation). The usual pattern of cold zones at the bottom of the valleys, warmer belts along the valley slopes, and cold mountain tops is modified by the terrain coverage type. Rural and forested areas normally have different surface temperatures, but along a vertical profile the temperature decrease (or increase) is often of the same order of magnitude. Because there is also a close correlation between the topography and terrain coverage (high percentage of forested areas at the valley slopes up to the timber line, much less along the valley floors), the surface temperature of the warm slope zone is increased compared to a valley profile with uniform coverage.

N80-25740*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
APPLICATION OF HCMM SATELLITE DATA TO THE STUDY OF URBAN HEATING PATTERNS Quarterly Report, 1 Dec. 1979 - 31 May 1980
Toby N. Carlson, Principal Investigator 1 Dec. 1979 4 p HCMM
(Contract NAS5-24264)
(E80-10165; NASA-CR-163182; QR-8) Avail: NTIS HC A02/MF A01 CSCL 13B

There are no author-identified significant results in this report.

N80-25741*# Canada Centre for Remote Sensing, Ottawa (Ontario).
HCMM: SOIL MOISTURE EXPERIMENT Progress Report
Josef Cihlar, Principal Investigator 30 Apr. 1980 4 p Sponsored by NASA HCMM
(E80-10166; NASA-CR-163183) Avail: NTIS HC A02/MF A01 CSCL 08M

There are no author-identified significant results in this report.

N80-25742*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS
Albert Rango, ed. and Ralph Peterson, ed. (GE, Beltsville, Md.)
May 1980 294 p refs Workshop held at Sparks, Nev., 16-17 Apr. 1979; sponsored in part by Nevada Univ. Original contains imagery. Original photography may be purchased form the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E80-10167; NASA-CP-2116) Avail: NTIS HC A13/MF A01 CSCL 08L

The history of remote sensing of snow cover is reviewed and the following topics are covered: various techniques for interpreting LANDSAT and NOAA satellite data; the status of future systems for continuing snow hydrology applications; the use of snow cover observations in streamflow forecasts by Applications Systems Verification and Transfer participants and selected foreign investigators; and the benefits of using satellite snow cover data in runoff prediction. For individual titles, see N80-25743 through N80-25759.

N80-25743*# Environmental Research and Technology, Inc., Concord, Mass.
THE EVOLUTION OF SATELLITE SNOW MAPPING WITH EMPHASIS ON THE USE OF LANDSAT IN THE SNOW ASUT STUDY AREAS
James C. Barnes and Clinton J. Bowley, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 1-19 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25744*# National Environmental Satellite Service, Washington, D. C.
THE NOAA/NESS PROGRAM FOR OPERATIONAL SNOWCOVER MAPPING: PREPARING FOR THE 1980'S
Stanley R. Schneider, Principal Investigator *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 21-39 refs Original contains imagery. Original photography may be purchased from the EROS

Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25745*# National Environmental Satellite Service, Washington, D. C.
NEW GOALS FOR SNOW MONITORING BY SATELLITE
D. R. Wiesnet, Principal Investigator *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 41-51 refs ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25746*# Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.
MAPPING NEW ZEALAND AND ANTARCTIC SNOWPACK FROM LANDSAT
I. L. Thomas, T. D. Prowse (Canterbury Univ.), and I. F. Owens, Principal Investigators (Canterbury Univ.) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 53-72 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25747*# Zurich Univ. (Switzerland). Dept. of Geography.
DIGITAL MAPPING OF MOUNTAIN SNOWCOVER UNDER EUROPEAN CONDITIONS
Harold Haefner, Principal Investigator *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 73-91 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A method for monitoring the snow cover in high mountain terrain such as the Swiss Alps includes the rapid classification of multitemporal data for small watersheds with very high accuracy. In addition to LANDSAT channels 4,5,6 and 7 an artificial channel was created containing the average altitude information of each pixel and allowing a subdivision of the watershed in accordance to the requirements of the runoff model. Even in very small watersheds of about 40 sq km the results achieved from LANDSAT data are at least as accurate as the ones gained from measurements of orthophotographs.

N80-25748*# IBM Norway, Oslo.
APPLICATION OF SATELLITE DATA FOR SNOW MAPPING IN NORWAY
H. A. Odegaard, T. Andersen (Norwegian Water Resources and Elec. Board, Oslo), and G. Ostrem, Principal Investigators (Norwegian Water Resources and Elec. Board, Oslo) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 93-106 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A close quantitative relationship was found between snow covered areas and subsequent runoff for different parts of the country despite climate differences. Digital LANDSAT datu can be used for areas down to approximately 10 sq km to 20 sq km for accurate measurement of snow cover extent. On large watersheds (more than 500 sq km), digital NOAA/TIROS imagery can be used for snow mapping if the area/runoff relationship is determined by using observations from previous years.

N80-25749*# Geological Survey, Phoenix, Ariz.
SATELLITE SNOWCOVER AND RUNOFF MONITORING IN CENTRAL ARIZONA
Herbert H. Schumann, Edib Kirdar (Salt River Project), and William L. Warskow, Principal Investigators (Salt River Project) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 107-126 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. Although the very high resolution experimental LANDSAT imagery permits rapid snow cover mapping at low cost, only one observation is available very 9 days. In contrast, low resolution operational imagery acquired by the ITOS and SMS/GOES satellites provide the daily synoptic observations necessary to monitor the rapid changes in snow covered areas in the entire Salt-Verde watershed. Geometric distortions in meteorological satellite imagery require specialized optical equipment or digital image processing for snow cover mapping.

N80-25750*# Bonneville Power Administration, Portland, Oreg.
USE OF SATELLITE DATA IN RUNOFF FORECASTING IN THE HEAVILY FORESTED, CLOUD-COVERED PACIFIC NORTHWEST
John P. Dillard and Charles F. Orwig, Principal Investigators (Natl. Weather Serv., Portland, Oreg.) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 127-150 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. Satellite-derived snow cover data improves forecasts of stream flow but not at a statistically significant amount and should not be used exclusively because of persistent cloud cover. Based upon reconstruction runs, satellite data can be used to augment snow-flight data in the Upper Snake, Boise, Dworshak, and Hungry Horse basins. Satellite data does not compare well with aerial snow-flight data in the Libby basin.

N80-25751*# Soil Conservation Service, Denver, Colo.
LANDSAT DERIVED SNOWCOVER AS AN INPUT VARIABLE FOR SNOWMELT RUNOFF FORECASTING IN SOUTH CENTRAL COLORADO
B. A. Shafer and C. F. Leaf, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 151-169 refs ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25752*# Colorado Div. of Water Resources, Denver.
A GRAPHICAL METHOD OF STREAM RUNOFF PREDICTION FROM LANDSAT DERIVED SNOWCOVER DATA FOR WATERSHEDS IN THE UPPER RIO GRANDE BASIN OF COLORADO
George F. Moravec and Jeris A. Danielson, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 171-183 refs ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25753*# California State Dept. of Water Resources, Sacramento.
APPLICATION OF SNOWCOVERED AREA TO RUNOFF FORECASTING IN SELECTED BASINS OF THE SIERRA NEVADA, CALIFORNIA
A. J. Brown and J. F. Hannaford, Principal Investigators (Sierra Hydrotech) *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 185-200 refs ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. Direct overlay onto 1:1,000,000 prints takes about one third the time of 1:500,000 zone transfer scope analysis using transparencies, but the consistency of the transparencies reduce the time for data analysis. LANDSAT data received on transparencies is better and more easily interpreted than the near real-time data from Quick Look, or imagery from other sources such as NOAA. The greatest potential for water supply forecasting is probably in improving forecast accuracy and in expanding forecast services during the period of snowmelt. Problems of transient snow line and uncertainties in future weather are the main reasons that snow cover area appears to offer little in water supply forecast accuracy improvement during the period snowpack accumulation.

N80-25754*# Sierra Hydrotech, Placerville, Calif.
APPLICATION OF SATELLITE IMAGERY TO HYDROLOGIC MODELING SNOWMELT RUNOFF IN THE SOUTHERN SIERRA NEVADA
J. F. Hannaford and R. L. Hall, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 201-222 refs ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25755*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DISCHARGE FORECASTS IN MOUNTAIN BASINS BASED ON SATELLITE SNOW COVER MAPPING
J. Martinec (Federal Inst. for Snow and Avalanche Res., Davos, Switzerland) and Albert Rango, Principal Investigators *In its* Operational Appl. of Satellite Snowcover Observations May 1980 p 223-238 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57189 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A snow runoff model developed for European mountain basins was used with LANDSAT imagery and air temperature data to simulate runoff in the Rocky Mountains under conditions of large elevation range and moderate cloud cover (cloud cover of 40% or less during LANDSAT passes 70% of the time during a snowmelt season). Favorable results were obtained for basins with area not exceeding serval hundred square kilometers and with a significant component of subsurface runoff.

N80-25756*# Ecosystems International, Inc., Gambrills, Md.
COST/BENEFIT ANALYSIS FOR THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS (OASSO)
Peter A. Castruccio, Harry L. Loats, Jr., Donald Lloyd, and Pixie A. B. Newman, Principal Investigators *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 239-254 refs ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. The total cost associated with satellite snow cover area measurement (SATSCAM) in the Colorado ASVT was $2,050 which equates to 0.22/sq km. When extrapolated to the 2,238,890 km area impacted by snow-survey forecasting in the Western United States, the total yearly cost of employing SATSCAM is approximately $493k. The estimated total benefits to hydroeletric energy production is $10m yearly, with the Pacific Northwest receiving the smallest benefits, and the Rio Grande region the highest. Irrigated agriculture receives a yearly total benefit of $38m, with the Lower Colorado region receiving the largest per acre benefit and the Pacific Northwest receiving the lowest.

N80-25757*# National Environmental Satellite Service, Washington, D. C.
SNOW EXTENT MEASUREMENTS FROM GEOSTATIONARY SATELLITES USING AN INTERACTIVE COMPUTER SYSTEM
R. S. Gird, Principal Investigator *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 255-265 refs ERTS (For primary document see N80-25742 16-43)
(Contract NAS5-21798)
Avail: NTIS HC A13/MF A01 CSCL 08L

The author has identified the following significant results. A time series of GOES full resolution visible image sectors was viewed on the McIDAS video component in chronological order and registered to within plus or minus 1 image pixel to compute real time snow melting rates. Synoptic scale clouds were eliminated to create a snow covered area from a composite image. Results show good agreement with NESS products although a significant difference was noted for one two-day period when the NESS products showed an increase in the snow cover for the Verde Basin, while the GOES/McIDAS product implied no change in the snow cover for approximately the same period. A check of NWS radar reports indicated no precipitation had occurred within the Verde basin. The use of the registered image sequence eliminates instrument error since small changes in the snow cover between any two days are easily detected.

N80-25758*# National Environmental Satellite Service, Washington, D. C.
AN ALL-DIGITAL APPROACH TO SNOW MAPPING USING GEOSTATIONARY SATELLITE DATA
J. D. Tarpley, Stanley B. Schneider, Principal Investigators, Edwin J. Danaher, and Gordon I. Myers *In* NASA. Goddard Space Flight Center Operational Appl. of Satellite Snowcover Observations May 1980 p 267-279 refs Original contains imagery. Original photography may be purchased form the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25759*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A REVIEW OF LANDSAT-D AND OTHER ADVANCED SYSTEMS RELATIVE TO IMPROVING THE UTILITY OF SPACE DATA IN WATER-RESOURCES MANAGEMENT
V. V. Salomonson and D. K. Hall, Principal Investigators *In its* Operational Appl. of Satellite Snowcover Observation May 1980 p 281-296 refs ERTS (For primary document see N80-25742 16-43)
Avail: NTIS HC A13/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-25760*# North Carolina State Univ. at Raleigh. Dept. of Electrical Engineering.
PATTERN CLASSIFICATION USING CHARGE TRANSFER DEVICES Final Report
16 Jun. 1980 138 p refs
(Grant NsG-1535)
(NASA-CR-163237) Avail: NTIS HC A07/MF A01 CSCL 14E

The feasibility of using charge transfer devices in the classification of multispectral imagery was investigated by evaluating particular devices to determine their suitability in matrix multiplication subsystem of a pattern classifier and by designing a protype of such a system. Particular attention was given to analog-analog correlator devices which consist of two tapped delay lines, chip multipliers, and a summed output. The design for the classifier and a printed circuit layout for the analog boards were completed and the boards were fabricated. A test j;g for the board was built and checkout was begun. Author

N80-25761*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ALBEDO OF SNOW FOR PARTIALLY CLOUDY SKIES
B. J. Choudhury and A. T. C. Chang Apr. 1980 38 p refs Submitted for publication
(NASA-TM-80649) Avail: NTIS HC A03/MF A01 CSCL 08L

The input parameters of the model are atmospheric precipitable water, ozone content, turbidity, cloud optical thickness, size

and shape of ice crystal of snow and surface pressure. The model outputs spectral and integrated solar flux snow reflectance as a function of solar elevation and fractional cloudcover. The model is illustrated using representative parameters for the Antarctic coastal regions. The albedo for a clear sky depends inversely on the solar elevation. At high elevation the albedo depends primarily upon the grain size; at low elevation this dependence is on grain size and shape. The gradient of the albedo-elevation curve increases as the grains get larger and faceted. The albedo for a dense overcast is a few percent higher than the clear sky albedo at high elevations. A simple relation between the grain size and the overcast albedo is obtained. For a set of grain size and shape, the albedo matrices (the albedo as a function of solar elevation and fractional cloudcover) are tabulated. A.R.H.

N80-25762*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AN ALTERNATE ALGORITHM FOR CORRECTION OF THE SCANNING MULTICHANNEL MICROWAVE RADIOMETER POLARIZATION RADIANCES USING NIMBUS-7 OBSERVED DATA

Per Gloersen, D. J. Cavalieri, and Harold V. Soule (OAO Corp., Beltsville, Md.) Apr. 1980 27 p refs Submitted for publication

(NASA-TM-80672) Avail: NTIS HC A03/MF A01 CSCL 14B

The manner in which Nimbus-7 scanning multichannel microwave radiometer (SMMR) scan radiance data was used to determine its operational characteristics is described. The predicted SMMR scan radiance was found to be in disagreement at all wavelengths with a large area of average measured ocean radiances. A modified model incorporating a different phase shift for each of the SMMR horizontal and vertical polarization channels was developed and found to provide good data correlation. Additional study is required to determine the validity and accuracy of this model. A.R.H.

N80-25763*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OVERSEAS TRIP REPORT, CV 990 UNDERFLIGHT MISSION

P. Gloersen, J. Crawford, and L. Hardis (OAO Corp., Beltsville, Md.) Mar. 1980 95 p refs

(NASA-TM-80662) Avail: NTIS HC A05/MF A01 CSCL 08L

The scanning microwave radiometer-7 simulator, the ocean temperature scanner, and an imaging scatterometer/altimeter operating at 14 GHz were carried onboard the NASA CV-990 over open oceans, sea ice, and continental ice sheets to gather surface truth information. Data flights were conducted over the Norwegian Sea to map the ocean polar front south and west of Bear Island and to transect several Nimbus-7 footprints in a rectangular pattern parallel to the northern shoreline of Norway. Additional flights were conducted to obtain correlative data on the cryosphere parameters and characteristics of the Greenland ice sheet, and study the frozen lakes near Barrow. The weather conditions and flight path way points for each of the nineteen flights are presented in tables and maps. A.R.H.

N80-25764*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ECONOMIC BASELINES FOR CURRENT UNDERGROUND COAL MINING TECHNOLOGY Final Report

William B. Mabe 15 Dec. 1979 65 p refs

(Contracts NAS7-100; ET-75-1-01-9036)

(NASA-CR-163259; JPL-Pub-79-122) Avail: NTIS HC A04/MF A01 CSCL 08I

The cost of mining coal using a room pillar mining method with continuous miner and a longwall mining system was calculated. Costs were calculated for the years 1975 and 2000 time periods and are to be used as economic standards against which advanced mining concepts and systems will be compared. Some assumptions were changed and some internal model stored data was altered from the original calculations procedure chosen, to obtain a result that more closely represented what was considered to be a standard mine. Coal seam thicknesses were varied from one and one-half feet to eight feet to obtain the cost of mining coal over a wide range. Geologic conditions were selected that had a minimum impact on the mining productivity. E.D.K.

N80-25765# Colorado State Univ., Fort Collins. Dept. of Earth Resources.

APPLICATIONS OF REMOTE SENSING TO EMERGENCY MANAGEMENT Final Report, 15 May 1979 - 15 Feb. 1980

William E. Marlatt and E. Bruce Jones (Resources Consultants, Inc., Fort Collins, Colo.) 15 Feb. 1980 61 p

(Contract DCPA01-79-C-0268)

(AD-A082243) Avail: NTIS HC A04/MF A01 CSCL 14/5

Contents: foundations of remote sensing; data acquisition and interpretation; availability of remote sensing technology for disaster response; imaging systems, current and near future satellite and aircraft remote sensing systems; utilization of remote sensing in disaster response; categories of disasters, phases of monitoring activities; recommendations for utilization of remote sensing technology in disaster response; selected reading. GRA

N80-25766# Sandia Labs., Albuquerque, N. Mex.

DRILLING HORIZONTAL HOLES IN COAL BED FROM THE SURFACE WITH WATER JETS

Marvin Timmerman and Clark R. Barker 1980 14 p refs Presented at 5th Symp. of the Rocky Mountain Fuel Soc., Salt Lake City, 21 Feb. 1980

(Contract EY-76-C-04-0789)

(SAND-80-0057C; CONF-800229-1) Avail: NTIS HC A02/MF A01

A drilling system, using high pressure water jets is considered. The system could have important applications both in methane drainage and recovery and in well linking. DOE

N80-25767# Wyoming Univ., Laramie. Dept. of Electrical Engineering.

REMOTE ELECTROMAGNETIC SENSING OF UNDERGROUND COAL BURNS Final Report, Jun. 1976 - Jul. 1978

Edmund A. Quincy Oct. 1979 43 p refs

(Contract EX-76-S-01-2414)

(FE-2414-8) Avail: NTIS HC A03/MF A01

This research program developed an induction sounding system and estimator algorithm for remote determination of the location, shape and size of the reaction zone produced by Underground Coal Gasification. It was tested in Wyoming at DOE/LETC sites Hanna 2, Phase 1 and Hanna 2, Phases 2 and 3. Estimates of the volumes of coal gasified compared favorably with that obtained formerly by chemical estimation. However, the burn may have deviated to the side of the gasification wells more than was predicted by chemical instrumentation. Measurements taken repeatedly over a one year span on one traverse at Hanna 2, Phases 2 and 3 show aging characteristics that demonstrate a migration of the conducting anomaly toward the surface. The final system employed horizontal loops with a fixed separation and 0 to 10 kHz bandwidth. Soundings were made in line across the burn site. Pseudo-noise/cross-correlation techniques were employed to effectively combat the noise. The magnitude response at 1 kHz was used in the final statistical fitting of field data to induction models. DOE

N80-25768# New Mexico Inst. of Mining and Technology, Socorro. Petroleum Recovery Research Center.

DISPLACEMENT OF OIL BY CARBON DIOXIDE Annual Report, Oct. 1978 - Sep. 1979

F. M. Orr, Jr. and J. J. Taber Feb. 1980 72 p refs

(Contract DE-AC21-78MC-03260)

(DOE/MC-03260/4) Avail: NTIS HC A04/MF A01

A sophisticated apparatus for measurements of phase behavior and fluid properties of mixtures of CO2 and crude oils was designed and built. The experimental setup permits a variety of multiple contact phase behavior experiments which explore mixture compositions which realistically model displacement processes at temperatures and pressures of interest. Gas chromatography techniques used to characterize crude oils was extended to allow analyses of mixtures containing CO2 and hydrocarbons ranging from methane to molecules as heavy as tetracontane (C40). A qualitative analysis is given for the complex

phase behavior observed for mixtures of CO2 and crude oils at temperatures below 50 C and the effects of phase behavior on expected displacement efficiency are calculated. The results indicate that relatively small changes in pressure can be expected to have a strong influence on the efficiency of CO2 displacements of crude oils. DOE

N80-25769# Department of Energy, Washington, D. C.
STRATEGIC PETROLEUM RESERVE Annual Report
16 Feb. 1980 86 p
(DOE/RA-0047) Avail: NTIS HC A05/MF A01

Progress on implementing the Strategic Petroleum Reserve (SPR) program is reported. The volume of crude oil in storage through 1979 is 91.7 million barrels, the average cost of which was $14.00 per barrel. Phase 1 facilities development is described. The total reserve storage capacity is 226 million barrels and will be increased to 248 million barrels by the time Phase 1 is complete. Phase 2 construction goods are described. Changes in the world crude market has forced changes in realistic goals for 1979. Development of improved geotechnical capability for the SPR by interagency, laboratory and contractor support is discussed. The cost control and program management was improved and management disciplines were emphasized in 1979. The Distribution Plan for the SPR utilizing methods of allocation or competitive sale are described. DOE seeks to minimize the effects of SPR purchases on world oil prices and on the availability of supplies for domestic consumption. DOE

N80-25770*# New Mexico Univ., Albuquerque. Technology Applications Center.
REMOTE SENSING APPLIED TO PETROLEUM AND MINERAL EXPLORATION. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Dec. 1979
Robert W. Gonzales Feb. 1980 34 p Sponsored by NASA and NTIS
(NASA-CR-163311; PB80-804800) Avail: NTIS HC $30.00/MF $30.00 CSCL 08I

The use of LANDSAT Satellites and other remote sensing methods used in petroleum and mineral exploration is discussed in 118 abstracts. Topics covered include mineral deposits, oil exploration, petroleum operations, geomorphology, resources management, thematic mapping, photogeology, photomapping and photointerpretation and imaging and digital techniques. GRA

N80-25771# National Technical Information Service, Springfield, Va.
INSTRUMENTATION AND DATA PROCESSING USED IN EARTH RESOURCES TECHNOLOGY SATELLITES (ERTS), VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - 1979
Audrey S. Hundemann Mar. 1980 244 p Supersedes NTIS/PS-79/0206; NTIS/PS-78/0070; NTIS/PS-77/0081 (PB80-805740; NTIS/PS-79/0206; NTIS/PS-78/0070; NTIS/PS-77/0081) Avail: NTIS HC $30.00/MF $30.00 CSCL 14B

Abstracts are cited dealing with new or improved remote sensing techniques. Topic areas cover pattern recognition, spectrum analysis, image enhancement, photointerpretation, multispectral photography, and mapping. This updated bibliography contains 237 abstracts, 35 of which are new entries to the previous edition. GRA

N80-25772# National Environmental Satellite Service, Washington, D. C.
DATA EXTRACTION AND CALIBRATION OF TIROS-N/ NOAA RADIOMETERS
Levin Lauritson, Gary J. Nelson, and Frank W. Porto Nov. 1979 80 p refs
(PB80-150824; NOAA-TM-NESS-107; NOAA-80010909) Avail: NTIS HC A05/MF A01 CSCL 22A

The TIROS N/NOAA series is the third generation of environmental satellites providing real-time data to direct readout users. Information is presented that enables users to extract from the telemetry streams data that are unique to a given sensor, to calibrate these data, and to develop an understanding of the accuracy and precision that can be expected of the calibrated data. GRA

N80-25773# Bureau of Mines, Pittsburgh, Pa. Pittsburgh Research Center.
DUST CONTROL FOR A BORER-TYPE CONTINUOUS MINER USING A VENTURI SCRUBBER ON A TRANSFER CAR
Natesa I. Jayaraman 1979 16 p refs
(PB80-144850; BM-RI-8408; LC-79-607043) Avail: NTIS HC A02/MF A01 CSCL 08I

A transfer car to carry the major components of a ventilation system designed for use with a borer-type continuous miner was designed. Dusty air was pulled through a 6,500 cfm venturi scrubber by a centrifugal fan mounted on the transfer car. The air passed through ducting installed on the miner and through flexible tubing between the miner and the transfer car. GRA

N80-25774# Oklahoma State Univ., Stillwater. Fluid Power Research Center.
DEVELOPMENT OF LIGHTWEIGHT MINE ROOF SUPPORTS Final Report, 1 Oct. 1977 - 31 May 1978
Aug. 1978 196 p refs
(Contracts DI-BM-H0-272017; DAAK70-77-C-0097)
(PB80-143936; BM-OFR-93-79) Avail: NTIS HC A09/MF A01 CSCL 08I

A load capacity of 196 kN (22 tons) and a height adjustable between 1.829 m (72 inches) and 2.438 m (96 inches) were taken as the design parameter for coal mine roof supports. The design goal was a unit weighing less than 22.3 kg (50 lb). Three alternative design concepts were explored: namely, mechanical, hydraulic, and hydromechanical, and 13 designs were analyzed in detail. Steel, aluminum alloy, and composites were the main potential construction materials investigated for suitability from structural, life, safety, and other considerations. It is shown that by using realistic mathematical models for stress and deflection calculations that it is possible to reduce prop weight to the design goal. The analysis presented for all-hydraulic props is applicable to hydraulic cylinders on all mining equipment and similar equipment. The computer program and user's guide are included as well as a bibliography on structural composites. GRA

N80-25775# Geological Survey, Reston, Va.
U.S. GEOLOGICAL SURVEY SOURCES OF PHOTOGRAPHS AND IMAGES OF BIOSPHERE RESERVES TAKEN FROM SPACECRAFT AND AIRCRAFT, SEQUOIA, KINGS, CANYON NATIONAL PARK, CALIFORNIA. PROJECT NO. 8: CONSERVATION OF NATURAL AREAS AND OF THE GENETIC MATERIAL THEY CONTAIN
Janet Bonner, comp. 1980 12 p refs
(PB80-147291) Avail: NTIS HC A02/MF A01 CSCL 08F

Photographs and images of biosphere reserves taken from spacecraft and aircraft provide a significant data base showing broad views and details of the landscape and are invaluable in searching for changes and trends in forest, cover, water area, and other diagnostic landscape features. Each data report in this series lists remotely sensed data gathered from spacecraft and aircraft available for a single biosphere reserve. Computer listings of data are provided by the EROS Data Center of the U.S. Geological Survey, which contains in its archives all of the listed material in photographic form and, in the case of LANDSAT images, can make available computer-compatible magnetic tapes of any LANDSAT scene. GRA

N80-25776# National Geodetic Survey, Rockville, Md.
USE OF AUXILLIARY ELLIPSOIDS IN HEIGHT-CONTROLLED SPATIAL ADJUSTMENTS
B. R. Bowring and T. Vincenty Nov. 1979 15 p refs
(PB80-155104; NOAA-TM-NOS-NGS-23; NOAA-80010901) Avail: NTIS HC A02/MF A01 CSCL 08E

In an adjustment of a geodetic network in the height-controlled three dimensional system it is convenient to use auxiliary ellipsoids. These surfaces are used for preserving correct heights of points and for simplifying the transformation of adjusted Cartesian coordinate to the geographic system. GRA

N80-25777# Arizona Univ., Tucson.
GEOPHYSICAL AND HYDROLOGIC PREDICTION OF FISSURING AND LAND SUBSIDENCE, SOUTH-CENTRAL ARIZONA Progress Report, 1 Oct. 1976 - 30 Sep. 1978

J. K. Boling, Jr., M. C. Carpenter, and S. N. Davis Jan. 1980 48 p refs
(Contracts DI-14-34-0001-7005; DI-14-34-0001-7006; DI-14-34-0001-8003)
(PB80-151434; WBO-03710; OWRT-A-073OARIZ(2)) Avail: NTIS HC A03/MF A01 CSCL 08G

Bimonthly horizontal strain measurements of fissures were made at seven dial gauges near Signal Peak Mountains, and in Avra Valley, Arizona. A Pyrex glass rod is fixed in one side of a fissure and pushes against a dial gaugefixed to the other side. Installations are in shallow covered trenches. Movemnets ranging form 5 micrometers to 25 mm are detected with a measurement error of less than 5 micrometers. Fissures were observed to open and close repeatly. With one exception, old and new cracks showed no pronounced differnece in character. Correlation of fissure movement, rainfall, pumping, and water-level fluctuations indicates that major earth fissure movements will occur after high pumping rates during or shortly after large storms. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N80-25778 Oklahoma State Univ., Stillwater.
DESIGN PARAMETERS FOR SOLAR POWERED ABSORPTION COOLING SYSTEMS WITH CHILLED WATER STORAGE Ph.D Thesis
Ping-Shian Shih 1979 120 p
Avail: Univ. Microfilms Order No. 8013046

A simulation model of a solar cooling system with chilled water storage was formulated. Simulations were performed using typical meteorological year data of seven SOLMET stations to study the relationship between the performance of the system and design parameters. The chilled water storage was found to be an effective scheme for improving the performance of the solar cooling system. The effectiveness of this scheme depends largely on the proper sizing of the chilled water storage, and collector area. The predictions of the semi-empirical equation were found to be within six percent accuracy of the simulation results. This equation was also found to be valid for locations with considerable differences in their weather patterns. The annual cost analysis showed that proper sizing of the chilled water storage, hot water storage, and collector area can improve significantly the economics of the solar cooling system. Although the solar cooling system is not economically feasible at the present time due to the high cost of the solar energy collector and the low cost of the conventional fuel, a properly designed solar cooling system can become economically attractive when the fuel cost becomes more expensive. Dissert. Abstr.

N80-25779*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL ENERGY STORAGE
Jun. 1980 77 p refs
(Contract EC-77-A-31-1034)
(NASA-TM-81514; E-457; DOE/NASA/1034-8) Avail: NTIS HC A05/MF A01 CSCL 10C

The planning and implementation of activities associated with lead center management role and the technical accomplishments pertaining to high temperature thermal energy storage subsystems are described. Major elements reported are: (1) program definition and assessment; (2) research and technology development; (3) industrial storage applications; (4) solar thermal power storage applications; and (5) building heating and cooling applications. R.E.S.

N80-25780*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PULSE CHARGING OF LEAD-ACID TRACTION CELLS
John J. Smithrick May 1980 22 p refs
(Contract EC-77-A-31-1044)
(NASA-TM-81513; DOE/NASA/1044-6; E-454) Avail: NTIS HC A02/MF A01 CSCL 10C

Pulse charging, as a method of rapidly and efficiently charging 300 amp-hour lead-acid traction cells for an electric vehicle application was investigated. A wide range of charge pulse current square waveforms were investigated and the results were compared to constant current charging at the time averaged pulse current values. Representative pulse current waveforms were: (1) positive waveform-peak charge pulse current of 300 amperes (amps), discharge pulse-current of zero amps, and a duty cycle of about 50%; (2) Romanov waveform-peak charge pulse current of 300 amps, peak discharge pulse current of 15 amps, and a duty of 50%; and (3) McCulloch waveform peak charge pulse current of 193 amps, peak discharge pulse current of about 575 amps, and a duty cycle of 94%. Experimental results indicate that on the basis of amp-hour efficiency, pulse charging offered no significant advantage as a method of rapidly charging 300 amp-hour lead-acid traction cells when compared to constant current charging at the time average pulse current value. There were, however, some disadvantages of pulse charging in particular a decrease in charge amp-hour and energy efficiencies and an increase in cell electrolyte temperature. The constant current charge method resulted in the best energy efficiency with no significant sacrifice of charge time or amp-hour output. Whether or not pulse charging offers an advantage over constant current charging with regard to the cell charge/discharge cycle life is unknown at this time. R.E.S.

N80-25781*# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
INVESTIGATION OF RELIABILITY ATTRIBUTES AND ACCELERATED STRESS FACTORS ON TERRESTRIAL SOLAR CELLS Annual Report
J. W. Lathrop and J. L. Prince Apr. 1980 168 p
(NASA-CR-163209; JPL-9950-338; DOE/JPL-954929-80/7; AR-2) Avail: NTIS HC A08/MF A01 CSCL 10A

Three tasks were undertaken to investigate reliability attributes of terrestrial solar cells: (1) a study of the electrical behavior of cells in the second (reverse) quadrant; (2) the accelerated stress testing of three new state-of-the-art cells; and (3) the continued bias-temperature testing of four block 2 type silicon cells at 78 C and 135 C. Electrical characteristics measured in the second quadrant were determined to be a function of the cell's thermal behavior with breakdown depending on the initiation of localized heating. This implied that high breakdown cells may be more fault tolerant when forced to operate in the second quadrant, a result contrary to conventional thinking. The accelerated stress tests used in the first (power) quadrant were bias-temperature, bias-temperature-humidity, temperature-humidity, thermal shock, and thermal cycle. The new type cells measured included an EFG cell, a polycrystalline cell, and a Czochralski cell. Significant differences in the response to the various tests were observed between cell types. A microprocessed controlled, short interval solar cell tester was designed and construction initiated on a prototype. R.E.S.

N80-25782*# Pennsylvania Univ., Philadelphia. School of Electrical Engineering.
ANALYSIS AND EVALUATION IN THE PRODUCTION PROCESS AND EQUIPMENT AREA OF THE LOW-COST SOLAR ARRAY PROJECT Annual Report, Oct. 1978 - Oct. 1979
H. Goldman and M. Wolf Oct. 1979 203 p refs
(Contract JPL-954796)
(NASA-CR-163208; JPL-9950-342; DOE/JPL-954796-79/7) Avail: NTIS HC A10/MF A01 CSCL 10A

Analyses of slicing processes and junction formation processes are presented. A simple method for evaluation of the relative economic merits of competing process options with respect to the cost of energy produced by the system is described. An energy consumption analysis was developed and applied to determine the energy consumption in the solar module fabrication process sequence, from the mining of the SiO2 to shipping.

The analysis shows that, in current technology practice, inordinate energy use in the purification step, and large wastage of the invested energy through losses, particularly poor conversion in slicing, as well as inadequate yields throughout. The cell process energy expenditures already show a downward trend based on increased throughput rates. The large improvement, however, depends on the introduction of a more efficient purification process and of acceptable ribbon growing techniques. R.E.S.

N80-25783*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
TEST RESULTS ON THE FRENCHMAN'S REEF SOLAR DATA ACQUISITION AND CONTROL SYSTEM
15 Jan. 1980 19 p refs Sponsored in part by DOE
(Contract NAS8-32036)
(NASA-CR-161449) Avail: NTIS HC A02/MF A01 CSCL 10A

The Frenchman's Reef Data Acquisition and Control System (DACS), Sunlogger model 10000-1 was evaluated to determine the accuracy of control functions and the performance of the system in the environment of the planned installation site. The Sunlogger system was verified to perform normally in an environment of 100 F and approximately 90% humidity. It is recommended however that the Sunlogger be installed in a controlled environment with temperatures and humidity significantly lower than those referenced above. R.E.S.

N80-25784*# Radian Corp., Austin, Tex.
SOLAR HEATING AND COOLING DEMONSTRATION PROJECT AT RADIAN CORPORATION, AUSTIN, TEXAS Final Report
May 1980 41 p Sponsored in part by NASA
(Contract EX-76-C-01-2396)
(NASA-CR-161442) Avail: NTIS HC A03/MF A01 CSCL 10A

The solar heating and cooling system located at the Radian Corporation, Austin, Texas, is discussed. A technical description of the solar system is presented. The costs of the major components and the cost of installing the system are described. Flow diagrams and photographs of the solar system are provided. R.E.S.

N80-25785*# Georgia Inst. of Tech., Atlanta. Engineering Extension Lab.
PHOTOVOLTAIC SYSTEM COSTS USING LOCAL LABOR AND MATERIALS IN DEVELOPING COUNTRIES
Edward Jacobson, George Fletcher, and Gerald Hein 20 May 1980 60 p
(Grant NsG-3297)
(NASA-CR-163218) Avail: NTIS HC A04/MF A01 CSCL 10A

The use of photovoltaic (PV) technology in countries that do not presently have high technology industrial capacity was investigated. The relative cost of integrating indigenous labor (and manufacturing where available) into the balance of the system industry of seven countries (Egypt, Haiti, the Ivory Coast, Kenya, Mexico, Nepal, and the Phillipines) was determined. The results were then generalized to other countries, at most levels of development. The results of the study imply several conclusions: (1) the cost of installing and maintaining comparable photovoltaic systems in developing countries is less than in the United States; (2) skills and some materials are available in the seven subject countries that may be applied to constructing and maintaining PV systems; (3) there is an interest in foreign countries in photovoltaics; and (4) conversations with foreign nationals suggest that photovoltaics must be introduced in foreign markets as an appropriate technology with high technology components rather than as a high technology system. R.E.S.

N80-25786*# Telex Communications, Inc., Blue Earth, Minn.
SOLAR HEATING SYSTEM INSTALLED AT TELEX COMMUNICATIONS, INC., BLUE EARTH, MINNESOTA Final Report
26 Oct. 1977 177 p
(Contract E(49-18)-2376)
(NASA-CR-161437) Avail: NTIS HC A09/MF A01 CSCL 10A

The solar heating system for space heating a 97,000 square foot building which houses administrative offices, assembly areas, and warehouse space is summarized. Information on system description, test data, major problems and resolutions, performance, operation and maintenance manual, manufacturer's literature, and as-built drawings is presented. R.E.S.

N80-25787*# IBM Federal Systems Div., Huntsville, Ala.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: SEASONAL REPORT FOR DECADE 80 HOUSE, TUCSON, ARIZONA Progress Report, Nov. 1979 - Sep. 1979
May 1980 103 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-161450) Avail: NTIS HC A06/MF A01 CSCL 10A

The operational and thermal performance of the Decade 80 solar energy system is described. The system was designed by Cooper Development Association, Inc. with space heating and space cooling to a one-story, single family residence located in Tucson, Arizona. The Decade 80 House was designed and built in the mid-70's to be a showplace/workshop for solar energy utilization. Superior construction techniques, the use of quality materials and a full time maintenance staff have served to make the entire system an outstanding example of the application of solar energy for residential purposes. The luxury of a full time, on-site maintenance person is perhaps the single most important aspect of this program. While most installations cannot support this level of maintenance, it was very useful in keeping all subsystems operating in top form and allowing for a full season data collection to be obtained. Several conclusions were drawn from the long term monitoring effort, among which are: (1) flat plate collectors will support cooling; (2) definite energy savings can be realized; and (3) more frequent periodic maintenance may be required on solar energy systems that are not custom built. R.E.S.

N80-25788*# Gilliland-Bell Associates, Inc., Greenwood, S.C.
SOLAR HEATING AND HOT WATER SYSTEM INSTALLED AT MUNICIPAL BUILDING COMPLEX, ABBEVILLE, SOUTH CAROLINA Final Report
Nov. 1979 54 p Sponsored in part by NASA
(Contract EM-78-F-01-5202)
(NASA-CR-161443) Avail: NTIS HC A04/MF A01 CSCL 10A

Information on the solar energy system installed at the new municipal building for the City of Abbeville, SC is presented, including a description of solar energy system and buildings, lessons learned, and recommendations. The solar space heating system is a direct air heating system. The flat roof collector panel was sized to provide 75% of the heating requirement based on an average day in January. The collectors used are job-built with two layers of filon corrugated fiberglass FRP panels cross lapped make up the cover. The storage consists of a pit filled with washed 3/4 in - 1 1/2 in diameter crushed granite stone. The air handler includes the air handling mechanism, motorized dampers, air circulating blower, sensors, control relays and mode control unit. Solar heating of water is provided only those times when the hot air in the collector is exhausted to the outside. R.E.S.

N80-25789*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
UNFULFILLED TECHNOLOGY NEEDS IN SPACE POWER SYSTEMS
Luther W. Slifer, Jr. Apr. 1980 21 p refs Proposed for presentation at 15th Intersoc. Energy Conversion Engr. Conf., Seattle, 18-22 Aug. 1980
(NASA-TM-80677) Avail: NTIS HC A02/MF A01 CSCL 10A

Major power system technology development needs related to the solution of currently existing problems are defined. The identified problems were initially listed and categorized by technical area. They were then translated into terms of technology development requirements and consolidated where commonality was found. From these requirements, a set of ten specific recommendations for technology development was formulated. R.E.S.

N80-25790*# IBM Federal Systems Div., Huntsville, Ala.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: SEASONAL REPORT FOR IBM SYSTEM 1A, HUNTSVILLE, ALABAMA Contractor Report, Sep. 1978 - Aug. 1979
May 1980 85 p refs Sponsored in part by DOE
(Contract NAS8-32036)
(NASA-CR-161484) Avail: NTIS HC A05/MF A01 CSCL 10A

The operational and thermal performance of the solar energy system, Sims Prototype System 1A, is described. The system was designed by IBM to provide 50 to 60 percent of the space heating and domestic hot water preheating load to a 2,000 square foot floor space single family residence in the Huntsville area. The load design temperature inside the building was to be maintained at 70 degrees fahrenheit with auxiliary energy for heating supplied by an electric heat pump assisted by an electric resistance strip heater. In general the disappointing operation of this system is attributed to the manner in which it was used. The system was designed for residential application and used to satisfy the demands of an office environment. The differences were: (1) inside temperature was not maintained at 70 F as expected; and (2) hot water usage was much lower than expected. The conclusion is that the solar energy system must be designed for the type of application in which it is used. Misapplication usually will have an adverse affect on system performance.
R.E.S.

N80-25791*# IBM Federal Systems Div., Huntsville, Ala.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATON: SEASONAL REPORT FOR SOLARON-AKRON, AKRON, OHIO Contractor Report, Nov. 1978 - Oct. 1979
May 1980 87 p refs Sponsored in part by DOE
(Contract NAS8-32036)
(NASA-CR-161485) Avail: NTIS HC A05/MF A01 CSCL 10A

The operational and thermal performance of the solar energy system by Solaron Corporation is described. The system was designed to provide an 1940 square foot floor area with space heating and domestic hot water for a dual-level single family residence in Akron, Ohio. The solar energy system uses air as the heat transport medium, has a 546 square foot flat plate collector array subsystem, a 270 cubic foot rock thermal storage bin subsystem, a domestic hot water preheat tank, pumps, controls and transport lines. In general, the performance of the Solaron Akron solar energy system was somewhat difficult to assess for the November 1978 through October 1979 time period. The problems relating to the control systems, various solar energy leakages, air flow correction factors and instrumentation cause a significant amount of subjectivity to be involved in the performance assessment for this solar energy system. Had these problems not been present, it is felt that this system would have exhibited a resonably high level of measured performance.
R.E.S.

N80-25792*# United Technologies Corp., South Windsor, Conn. Power System Div.
COGENERATION TECHNOLOGY ALTERNATIVES STUDY. VOLUME 1: SUMMARY REPORT Final Report
Jan. 1980 125 p
(Contracts DEN3-30; EC-77-A-31-1062)
(NASA-CR-159759; DOE/NASA/0030-80/1;
UTC-FCR-1333-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 10A

Data and information in the area of advanced energy conversion systems for industrial congeneration applications in the 1985-2000 time period was studied. Six current and thirty-one advanced energy conversion systems were defined and combined with appropriate balance-of-plant equipment. Twenty-six industrial processes were selected from among the high energy consuming industries to serve as a framework for the study. Each conversion system was analyzed as a cogenerator with each industrial plant. Fuel consumption, costs, and environmental intrusion were evaluated and compared to corresponding traditional values. Various cogeneration strategies were analyzed and both topping and bottoming (using industrial by-product heat) applications were included. The advanced energy conversion technologies indicated reduced fuel consumption, costs, and emissions. Typically fuel energy savings of 10 to 25 percent were predicted compared to traditional on-site furnaces and utility electricity. With the variety of industrial requirements, each advanced technology had attractive applications. Overall, fuel cells indicated the greatest fuel energy savings and emission reductions. Gas turbines and combined cycles indicated high overall annual cost savings. Steam turbines and gas turbines produced high estimated returns. In some applications, diesels were most efficient. The advanced technologies used coal-derived fuels, or coal with advanced fluid bed combustion or on-site gasification systems.
R.E.S.

N80-25793*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
COGENERATION TECHNOLOGY ALTERNATIVES STUDY. VOLUME 2: INDUSTRIAL PROCESS CHARACTERISTICS Final Report
Jan. 1980 697 p refs
(Contracts DEN3-30; EC-77-A-31-1062)
(NASA-CR-159760; DOE/NASA/0030-80/2;
UTC-FCR-1333-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 10A

Information and data for 26 industrial processes are presented. The following information is given for each process: (1) a description of the process including the annual energy consumption and product production and plant capacity; (2) the energy requirements of the process for each unit of production and the detailed data concerning electrical energy requirements and also hot water, steam, and direct fired thermal requirements; (3) anticipated trends affecting energy requirements with new process or production technologies; and (4) representative plant data including capacity and projected requirements through the year 2000.
R.E.S.

N80-25794*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
COGENERATION TECHNOLOGY ALTERNATIVES STUDY. VOLUME 4: HEAT SOURCES, BALANCE OF PLANT AND AUXILIARY SYSTEMS Final Report
Jan. 1980 296 p
(Contracts DEN3-30; EC-77-A-31-1062)
(NASA-CR-159762; DOE/NASA/0030-80/4;
UTC-FCR-1333-Vol-4) Avail: NTIS HC A13/MF A01 CSCL 10A

Data and information established for heat sources balance of plant items, thermal energy storage, and heat pumps are presented. Design case descriptions are given along with projected performance values. Capital cost estimates for representative cogeneration plants are also presented.
R.E.S.

N80-25795*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
COGENERATION TECHNOLOGY ALTERNATIVES STUDY. VOLUME 6: COMPUTER DATA Final Report
Jan. 1980 535 p
(Contracts DEN3-30; EC-77-A-31-1062)
(NASA-CR-159764; DOE/NASA/0030-80/6;
UTC-FCR-1333-Vol-6) Avail: NTIS HC A22/MF A01 CSCL 10A

The potential technical capabilities of energy conversion systems in the 1985 - 2000 time period were defined with emphasis on systems using coal, coal-derived fuels or alternate fuels. Industrial process data developed for the large energy consuming industries serve as a framework for the cogeneration applications. Ground rules for the study were established and other necessary equipment (balance-of-plant) was defined. This combination of technical information, energy conversion system data ground rules, industrial process information and balance-of-plant characteristics was analyzed to evaluate energy consumption, capital and operating costs and emissions. Data in the form of computer printouts developed for 3000 energy conversion system-industrial process combinations are presented.
R.E.S.

N80-25796# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
HEATING A FLUID IN FULL FLOW INSIDE A HORIZONTAL CYCLINDRICAL PIPE USING SOLAR ENERGY M.S. Thesis [AQUECIMENTO DE UM FLUIDO EM ESCOAMENTO COMPLETAMENTE ESTABELECIDO NO INTERIOR DE UM TUBO CILINDRICO HORIZONTAL USANDO ENERGIA

SOLAR]
Sebastiao Cardoso Feb. 1980 27 p refs In PORTUGUESE; ENGLISH summary
(INPE-1680-TDL/020) Avail: NTIS HC A03/MF A01

The transfer of heat in a stead laminar flow inside an horizontal cylindrical tube under solar radiation heating is discussed. It is supposed that the tube at rest and that the flow is fully developed to its profile. The mathematical analysis is limited to an analytical solution of the energy equation adjusted for the system. The angular, radial, and axial distributions of temperature are presented along with variations of the Nusselt and Peclet numbers as a function of the axial coordinate. J.M.S.

N80-25797# TRW Defense and Space Systems Group, Redondo Beach, Calif. Applied Technology Div.
POTENTIAL APPLICATIONS OF BIOMASS TECHNOLOGY AT NATIONAL TECHNOLOGY LABORATORIES AND MISSISSIPPI ARMY AMMUNITION PLANT Final Report, 30 Jun. 1978 - 29 Feb. 1980
E. P. Motley, B. G. Cruz, L. McClanathan, and J. A. Anastasi Feb. 1980 211 p
(Contract DAAK10-78-C-0268)
(AD-A082756; TRW-33682) Avail: NTIS HC A10/MF A01 CSCL 21/4

This study was initiated to evaluate the feasibility of utilizing a common biomass (energy wood) system to produce energy for use at NASA's National Space Technology Laboratories (NSTL) and the proposed Mississippi Army Ammunition Plant (MSAAP) to be established at NSTL. The study investigated: the form and quantity of energy required at NSTL and MSAAP; the amount and characteristics of the available energy wood supply; the conversion technology; the legal and environmental issues associated with the operation of an energy wood plant; and the economics of an energy wood plant. GRA

N80-25798# CCB/CUMALI Associates, Oakland, Calif.
PASSIVE SOLAR CALCULATION METHODS Final Report, 15 Oct. 1978 - 15 Jun. 1979
Zulfikar O. Cumali, A. Osman Sezgen, and Robert Sullivan 15 Jun. 1979 112 p refs
(Contract EM-78-C-01-5221)
(DSE-5221-T1) Avail: NTIS HC A06/MF A01

An analytical treatment related to the generation of space specific weighting factors is presented using a recursion relationship which employs a heat balance of both the outside and inside surface. The multizone problem is then discussed. The use of frequency domain methods is detailed such that the amplitude ratio and phase shift characteristics for a sinusoidal excitation are derived for the thermal load resulting from radiation heat gain/loss and space air temperature fluctuations. The results of a parametric study related to variable floor properties, radiation distributions and space sizes are presented. The weighting factors generated for each perturbation were used to define the expected differences in space response characteristics. DOE

N80-25799# Value Engineering Co., Alexandria, Va.
OTEC SUPPORT SERVICES Quarterly Technical Progress Report, 15 Nov. 1978 - 14 Feb. 1979
28 Feb. 1979 17 p
(Contract ET-78-C-02-4931)
(COO-4931-T11; QTPR-3) Avail: NTIS HC A02/MF A01

System integration, engineering, and management support services provided for the Ocean Thermal Energy Conversion (OTEC) Program are described. The tasks include (1) survey, analysis, evaluation, and recommendation concerning program performance; (2) program technical monitoring;(3) development and implementation of methodology to identify and evaluate program alternatives; (4) technical assessments; (5) OTEC system integration; and (6) environment and siting considerations. DOE

N80-25800# Science Applications, Inc., McLean, Va.
SOLAR PHOTOVOLTAIC FLAT PANEL APPLICATIONS EXPERIMENT AT THE OKLAHOMA CENTER FOR SCIENCE AND ARTS Final Report, 30 Sep. 1978 - 31 May 1979
31 May 1979 186 p refs
(Contracts ET-78-C-04-5403; DE-AC04-78ET-23063)
(DOE/ET-23063/1) Avail: NTIS HC A09/MF A01

A photovoltaic power system was designed for the Oklahoma Center for Science and Arts in Oklahoma City. The system, with a basic rating of 250 kW, is enhanced to a summer peak output of 350 kW through the use of augmentation glass mirror reflectors which are arranged to maximize summer output and to match the summer output to the summer load. The baseline system consists of 3780 photovoltaic collector modules, utilizing polycrystalline silicon cells, and companion mirror reflectors arranged in modular fashion on the roof of the Center. Total system output is more than 450 MWh, of which over 420 MWh is used on-site to displace about 65 percent of the current on site load, or about 43 percent of the projected (1981) load. Another 30 MWh is returned to the utility under a buyback agreement. The total amount of energy displaced per year is approximately 850 barrels of oil, or Btu equivalent. DOE

N80-25801# Electric Storage Battery Co., Yardley, Pa.
RESEARCH, DEVELOPMENT AND DEMONSTRATION OF LEAD-ACID BATTERIES FOR ELECTRIC VEHICLE PROPULSION Annual Report, 1978
Oct. 1979 106 p refs
(Contract W-31-109-eng-38)
(ANL/OEPM-78-8) Avail: NTIS HC A06/MF A01

The development of two levels of electric vehicle batteries, improved state-of-the-art (ISOA) and advanced is discussed. Two approaches, for the ISOA battery are being considered; one utilizing the flat pasted type plate in common use for present electric vehicle and automotive type batteries and the second utilizing the tubular type positive plate concept presently used in heavy duty industrial applications. Two battery design concepts appear to have the potential of meeting the advancing battery goals. One is tubular positive plate battery and the other is the bipolar type battery. R.E.S.

N80-25802# Gould, Inc., Rolling Meadows, Ill.
RESEARCH, DEVELOPMENT AND DEMONSTRATION OF NICKEL-ZINC BATTERIES FOR ELECTRIC VEHICLE PROPULSION Annual Report, 1978
Oct. 1979 143 p
(Contract W-31-109-eng-38)
(ANL/OEPM-78-11) Avail: NTIS HC A07/MF A01

The progress towards the demonstration of technical and economic feasibility of the nickel-zinc battery for electric vehicle propulsion is described. Six major tasks are discussed: separator development; zinc electrode development; product design and analysis; cell/module/battery testing; process development; and pilot plant. R.E.S.

N80-25803# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
CONCEPTUAL DESIGN OF ADVANCED CENTRAL RECEIVER POWER SYSTEMS SODIUM-COOLED RECEIVER CONCEPT. VOLUME 4: COMMERCIAL AND PILOT PLANT COST DATA Final Report
Mar. 1979 200 p refs
(Contract EG-77-C-03-1483)
(SAN-1483-1/5; ESG-79-2-Vol-4) Avail: NTIS HC A09/MF A01

Cost summaries are presented for the 100 MWe and and 281 MWe commercial plants, and a summary for the cost summary data include Nth plant data for the 100 MWe and 281 MWe commercial plants, and a summary for the alternative concept air-rock storage system. The plant costing technique is described in the section discussing the 100 MWe baseline concept. DOE

N80-25804# Oak Ridge Associated Universities, Inc., Washington, D.C. Inst. for Energy Analysis.
ITALY: ESTIMATES OF FUTURE ENERGY/GDP RELATIONSHIPS
C. Davison and Edward L. Allen Dec. 1979 61 p refs
(Contract EY-76-C-05-0033)
(ORAU/IEA(M)-79-20 Avail: NTIS HC A04/MF A01

The Italian economy has experienced very rapid growth since World War II, accompanied by a sharp increase in the consumption of energy, the growth of which has been more rapid than the development of the economy. For the period 1960-76, energy consumption grew an average of 6.7% annually, compared with an annual growth rate of 4.8% for gross domestic

product. The ratio of energy use per unit of GNP increased in every year from the early 1960s until the oil price rise in 1973 and after a brief pause then began to rise again. By 1975, when the E/GDP ratios of other industrialized OECD countries were hitting record lows, Italy's ratio was at an all-time high. This increasing E/GDP ratio was largely the result of Italy's very rapid industrial expansion and its attempt to catch up with the stage of industrial maturity already achieved in other developed countries. It is anticipated that the E/GDP ratio will decline in the future as Italy's industrial expansion slows down. Increased efficiencies will flow from the application of new technologies and replacement of old plants. Pressure from higher oil prices and structural changes in Italian society also will dampen the E/GDP ratio, as it has in other industrialized countries. GDP growth will slacken as the fertility rate continues its downward trend and the average workweek falls. It is that by the year 2000 gross energy consumption in Italy will total 6.7 quads, or about 25% above the 1976 level, and that the E/GDP index (1976 = 100) will decline to about 79, with the residential and industrial sectors accounting for almost all of the decline. DOE

N80-25806# Los Alamos Scientific Lab., N. Mex.
SUPERCONDUCTING MAGNETIC ENERGY STORAGE (SMES) PROGRAM Progress Report, 1 Jan. - 31 Dec. 1979
J. D. Rogers, comp. Jan. 1980 30 p refs
(Contract W-7405-eng-36)
(LA-8199-PR) Avail: NTIS HC A03/MF A01

Work on the development of two superconducting magnetic energy storage units is described. One is a 30-MJ unit for use by the Bonneville Power Administration to stabilize power oscillations on their Pacific ac Intertie, and the second is a 1 to 1 GWh unit for use as a diurnal load-leveling device. A contract was placed for the fabrication design of the 30 MJ coil design. Orders were placed for the stabilizing system converter and protective energy dump system, converter transformer, automation of the 4.5 K refrigerator and its installation into a trailer and a trailer mounted heat-rejection system. A third compressor was added to the refrigeration system, and the refrigerator was tested and accepted. The superconductor for the 30 MJ coil was received, tested, and found to be satisfactory. The reference design for the 1 to 10 GWh diurnal load-leveling unit was completed. The summary and recommendations of the study are included. DOE

N80-25808# Colorado State Univ., Fort Collins. Solar Applications Energy Lab.
CSU SOLAR HOUSE 3: SOLAR HEATING AND COOLING SYSTEM PERFORMANCE Progress Report, 1 Oct. 1978 - 31 May 1979
D. S. Ward Aug. 1979 47 p refs
(Contract DE-AC02-79CS-30122)
(COO-30122-3) Avail: NTIS HC A03/MF A01

During the period 1 October 1978 through 31 March 1979, the Chamberlain liquid-heating state-of-the-art flat-plate solar collector was evaluated for a complete heating season. Significant and important results of the systems evaluation include; (1) the demonstration of the critical importance of temperature differentials between the collector outlet and the absorption chiller generator inlet, the effects of alternative control strategies, the marginal feasibility of cool storage, the devastating effect on system performance due to heat losses from the thermal storage unit, and the importance of minimizing electrical parasitic power requirements in obtaining feasibilty for solar absorption cooling systems; (2) the concept of overall system efficiency was shown to be essential in the determination of the feasibility of any solar installation; and (3) evaluation of acquired data on the performance of the Colorado solar house system has provided the theoretical construction and experimental No.3 verification of the importance of solar operating threshold. DOE

N80-25807# Development Planning and Research Associates, Inc., Manhattan, Kans.
WIND ENERGY APPLICATIONS IN AGRICULTURE: EXECUTIVE SUMMARY Final Report
Milton L. David, Robert J. Buzenberg, Earl F. Glynn, Gary L. Johnson, J. Kenneth Shultis, and John P. Wagner Aug. 1979 209 p refs Sponsored in part by Dept. of Agriculture
(Contract EX-76-A-29-1026)
(DOE/SEA-1109-20401-79/2) Avail: NTIS HC A10/MF A01

An assessment is presented of the potential use of wind turbine generator systems (WTGS) in US agriculture. In particular, the number of WTGS's economically feasible for use in US agriculture and the conditions which yielded economic feasibility of WTGS's for certain agricultural applications are presented. In addition, for each case, i.e., set of assumed conditions, under which WTGS's were found to be economically feasible are identified: (1) the agricultural WTGS applications in terms of location, type and size (complete farm and dedicated-use applications); (2) the number of WTGS's by wind machine and generator size category; (3) aggregate energy conversion potential; and (4) other technical and economic WTGS performance data for particular applications. The methodology, data and assumptions used for the analysis are described. DOE

N80-25808# Department of Energy, Washington, D. C.
SYSTEMS ENGINEERING FOR POWER: ORGANIZATIONAL FORMS FOR LARGE SCALE SYSTEMS, VOLUME 1
L. H. Fink, ed. and T. A. Trygar, ed. Oct. 1979 376 p refs Conf. held at Davos, Switzerland, 30 Sep. - 5 Oct. 1979
(CONF-790904-P2) Avail: NTIS HC A17/MF A01

Several articles addressing electrical energy system engineering problems are presented. The development of decentralized organizational forms for large scale interconnected power systems is discussed. A number of strategies are investigated for obtaining the desired control structures including the approximation of centralized control laws; the development of controllers using multiple, approximate models of the overall system; the use of decomposition methods; and a direct formulation of decentralized optimal stochastic control problems. A particular emphasis is given to the numerical modeling methods for large scale systems. Descriptor system approaches are explored along with other deterministic and probabilistic modeling methods. Perturbation methods in the construction of model decompositions are analyzed and evaluated. M.G.

N80-25809# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMOELECTRIC GENERATOR TESTING AND RTG DEGRADATION MECHANISMS EVALUATION Progress Report
A. Lockwood and G. Stapfer Dec. 1979 49 p
(Contract EY-76-A-03-0959)
(SAN-0959-T2; PR-33) Avail: NTIS HC A03/MF A01

The *n*-type selenide legs after 10,600 hours continue to show agreement with published data. In the ingradient testing after 11,378 hours, the n-legs also show comparable performance to the published data. The new design p-type legs were placed on test. The remaining multihundred watt generator on test Q1-A has accumulated 19,567 hours and performance remains stable. Three 18 couple modules S/N-1, 2, and 3 previously tested were received for test and evaluation. S/N-1 had 1700 hours testing with results indistinguishable from those at the end testing in 1977. The performances of Lincoln Experimental Satellite 8/9 generators are following DEGRA predictions after 31,824 hours. The performance of the Voyager 1 and 2 radioisotope thermionic generators is reported after 19,577 hours and 20,122 hours of operation, respectively. DOE

N80-25810# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PROBLEMS AND OPPORTUNITIES FOR SOLAR ENERGY IN BIOMASS, PYROLYSIS, AND GASIFICATION
T. Reed Nov. 1979 12 p Presented at Solar Fuels Workshop, Albuquerque, N. Mex., 28-29 Nov. 1979
(Contract EG-77-C-01-4042)
(SERI/TP-332-495) Avail: NTIS HC A02/MF A01

Passive solar input for drying crops and wood already make a significant input to the US energy budget, and active solar drying, requiring temperatures below 200 C, can easily make an important substitution for fossil fuels in drying. Pyrolysis of biomass typically requires less than 1.6 MBtu/dry ton at a temperature of 500 C, and this could potentially be supplied by direct solar heating. The heat input is likely to be indirect heating of a solid, liquid or gas heat-transfer agent. Fast pyrolysis requires modest heat inputs with high heat-transfer rates at temperatures

over 900 C and thus may be particularly suited to focusing collectors as energy sources. Char gasification, using steam or CO2, requires large energy inputs at temperatures over 900 C and thus is the least likely field of application of solar energy. Ultimately, the large scale application of solar energy to biomass pyrolysis and gasification will depend on the relative cost of direct solar versus biomass inputs. Biomass energy inputs now typically cost 1 to 3$/MBtu; when direct solar heat costs begin to approach this level, direct solar process heat may be used for biomass conversion. DOE

N80-25811# Chicago Univ., Ill. Enrico Fermi Inst.
DESIGN AND TEST OF NON-EVACUATED SOLAR COLLECTORS WITH COMPOUND PARABOLIC CONCENTRATORS
A. Rabl, J. OGallagher, and R. Winston Jul. 1979 60 p refs
(Contract EY-76-S-02-2446)
(EFI-79-42) Avail: NTIS HC A04/MF A01

The intermediate range of concentration ratios (1.5X-10X) which can be achieved with CPC's without diurnal tracking provides both economic and thermal advantages for solar collector design even when used with nonevacuated absorbers. The present paper summarizes more than 3 years of research on nonevacuated CPC's and reviews measured performance data and critical design considerations. Concentrations in the upper portions of the practical range (e.g., 6X) can provide good efficiency (40 percent to 50 percent) in the 100 C to 160 C temperature range with relatively frequent tilt adjustments (12 to 20 times per year). At lower concentrations (e.g., 3X) performance will still be substantially better than for a double glazed flat plate collector above about 70 C and competitive below, while requiring only semiannual adjustments for year round operation. In both cases the cost savings associated with inexpensive reflectors, and the optimal coupling to smaller, simple inexpensive absorbers (e.g., tubes, fins, etc.) can be as important an advantage as the improved thermal performance. DOE

N80-25812# GTE Labs., Inc., Waltham, Mass.
DEVELOPMENT OF MATERIALS FOR A LUMINESCENT SOLAR COLLECTOR Annual Progress Report, 1 Sep. 1978 - 31 Aug. 1979
A. Lempicki, L. Andrews, and B. C. McCollum 1979 42 p refs
(Contract ER-78-C-02-4996)
(COO-4996-1) Avail: NTIS HC A03/MF A01

The objectives of the research involved preparation of a number of Cr(3+) doped glasses beginning with common commercial types, and expansion of the number and variety of glasses as time allowed. The Cr(3+) doped glasses were evaluated by spectroscopic measurements which included absorption and emission as well as quantum yield determinations. In addition, the influence of concentration quenching was measured by studying the luminescence decay kinetics at various concentrations in a variety of glasses. As the program developed, and the problem of rather low quantum yields became apparent in all the glasses, a rather detailed investigation was undertaken to better understand the radiationless decay of Cr(3+) in order to best evaluate the future direction of the program. The results are summarized. DOE

N80-25813# General Electric Co., Philadelphia, Pa. Advanced Energy Program.
SOLAIR HEATER PROGRAM: SOLAIR APPLICATIONS STUDY Final Report
Dec. 1977 96 p
(Contract EY-76-C-02-2705)
(COO-2705-3) Avail: NTIS HC A05/MF A01

The evaluation identified attractive applications, evaluated corresponding control procedures, estimated system performance, compared economically insolation and insulation, and evaluated the repackaging of off-the-shelf equipment for improved cost effectiveness. A detailed commercialization study of a residential domestic water heating system using the Solair concept which has been selected as the most attractive application was done. Other attractive applications are space/domestic water heating and a heat pump assisted solar system/domestic water heating where the heat pump and the solar system function in parallel. A prime advantage of heated air solar systems over liquid systems is cost and longer life which results in higher Btu's/dollar. Other air system advantages are no liquid leakage problems, no toxicity of freezing problems, and less complicated equipment. A hybrid solar system has been identified that can improve the market penetration of solar energy. Details of this system are provided. DOE

N80-25814# Argonne National Lab., Ill. Solar Energy Group.
DESIGN OF A SYSTEM USING CPC COLLECTORS TO COLLECT SOLAR ENERGY AND TO PRODUCE INDUSTRIAL PROCESS STEAM
C. K. Hsieh (Florida Univ., Gainesville) Aug. 1979 105 p refs
(Contract W-31-109-eng-38)
(ANL-79-102) Avail: NTIS HC A06/MF A01

A system was designed to use CPC collectors to collect solar energy and to generate steam for industrial process heat purposes. The system is divided into two loops with the collectors in the collector loop to operate a preheater and the collectors in the boiler loop to heat water to elevated pressures and temperatures. A flash boiler is used to throttle the heated water to steam. Two types of CPC collectors are chosen. In the collector loop the CPC collectors are fitted with concentric tube receivers. In the boiler loop the collectors employ heat pipes to transmit heat. This design is able to alleviate the scaling and plumbing problems. A fragile receiver tube can also be employed without rupture difficulties. The thermal processes in the collectors were analyzed using a computer modeling. The results were also used to develop a thermodynamic analysis of the total system. Calculations show that the design is technically feasible. The CPC collector is shown to have an efficiency that is very weakly dependent on its operating temperatures, which makes the collector particularly attractive in high temperature applications. DOE

N80-25815# Monsanto Research Corp., Dayton, Ohio.
SUPERIOR HEAT TRANSFER FLUIDS FOR SOLAR HEATING AND COOLING APPLICATIONS Semiannual Report, 20 Aug. 1978 - 20 Feb. 1979
Leo Parts, David R. Miller, and Quentin E. Thompson Sep. 1979 55 p refs
(Contract DE-AC04-78CS-45356)
(ALO-35356-1; MRC-DA-904) Avail: NTIS HC A04/MF A01

The objectives of this program are: (1) to quantify the required design and handling properties of heat transfer fluids for solar collector applications; (2) to collect data and pertinent information for all fluids presently used or envisioned as potentially useful in solar energy applications, based on the current state-of-the-art; and (3) to organize the latter information to allow the designers of solar collection systems to select optimum fluids for their particular needs. Two broad surveys were conducted. One encompassed the designers and manufacturers of solar collectors and collection systems to establish the data base for the required fluids properties. The results of this survey are summarized in this report. The second survey was addressed to the manufacturers of heat transfer fluids. A list of commercially available heat transfer fluids, to which further additions are anticipated, is also included. DOE

N80-25816# International Business Machines Corp., Gaithersburg, Md.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION, ALBUQUERQUE WESTERN NO. 1, ALBUQUERQUE, NEW MEXICO Progress Report, Oct. 1978 - Mar. 1979
C. M. Fu 1979 65 p refs
(Contract EG-77-C-01-4049)
(SOLAR/1011-79/14) Avail: NTIS HC A04/MF A01

The Albuquerque Western site is a four story, 110 unit apartment building in Albuquerque, New Mexico. The solar energy system consists of two independently controlled systems: one system serves domestic hot water (DHW) preheating needs, the other serves to preheat hot water used in space heating. Only the DHW system is described. The solar energy system has an array of tracking collectors with a gross area of 1782 square feet. The array faces south at an angle of 35 degrees to the the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage. Solar energy is stored in a 2000 gallon wooden tank that contains a plastic liner. The DHW is continuously circulated throughout the building. When solar energy is insufficient to satisfy the hot water energy

requirements, auxiliary heating is provided by an inline gas-fired boiler. An operational summary of the performance of the system for the period October 1978 through March 1979 is presented. DOE

N80-25817# Los Alamos Scientific Lab., N. Mex.
HIGH TEMPERATURE HYDROGEN CYCLES FOR SOLAR HEAT SOURCES
M. G. Bowman 1979 16 p refs Presented at Solar Fuels Workshop, Albuquerque, N. Mex., 28-29 Nov. 1979; sponsored by Solar Thermal Test Facilities Users Assoc. Submitted for publication
(Contract W-7405-eng-36)
(LA-UR-80-184; CONF-791143-3) Avail: NTIS HC A02/MF A01

Some of the criteria required for high temperature thermochemistry hydrogen cycles to couple efficiently with solar heat sources are defined. Some of the experimentally validated cycles that have been developed over the years in terms of these criteria are examined and potential cycles that are being considered for the higher temperatures potentially available from solar concentrators are discussed. Cycles discussed include oxide sulfate cycles, halide hydrolysis cycles, direct decomposition of H2O and CO2, oxide cycles, and sulfuric acid-metal cycles. DOE

N80-25818# Boeing Co., Seattle, Wash.
SOLAR PROJECT DESCRIPTION FOR A-FRAME INDUSTRIES' SINGLE FAMILY RESIDENCE: KANEOHE, HAWAII
27 Jul. 1979 44 p
(Contracts EX-76-A-29-1020; HUD-H-2372)
(SOLAR/1010-79/50) Avail: NTIS HC A03/MF A01

A solar energy system designed to provide domestic hot water heating is described. The system uses city water as the common heat transfer medium, and contains no energy storage tank or DHW tank heat exchanger loop. Therefore, the total operating energy is in the energy collection and storage subsystem (ECSS). The house has been fully instrumented for performance evaluation of the solar system since February 1978 and the compiled data are discussed. Original cost estimates for provisioning and installation of the solar system are given. DOE

N80-25819# Boeing Co., Seattle, Wash.
SOLAR PROJECT DESCRIPTION. ALBUQUERQUE WESTERN-2 MULTI-DWELLING BUILDING ALBUQUERQUE, NEW MEXICO
D. Moore 23 Nov. 1979 43 p refs
(Contracts EX-76-A-29-1020; HUD-H-2372)
(SOLAR/1090-79/50) Avail: NTIS HC A03/MF A01

The Albuquerque Western-2 site is a four-story, 110 unit apartment building in Albuquerque, New Mexico. The solar energy system consists of a controlled system to preheat hot water used in space heating. The solar energy system is designed to provide approximately 54 percent of the conditioned space heating load. The system has an array of tracking collectors with a gross area of 6429 square feet. The array faces south at an angle of 35 degrees to the horizontal. Water is used as the medium for delivering energy from the collector array to storage. Solar energy is stored underground in a 57,000 gallon concrete storage tank. During the space heating season, the heated water from storage is continuously circulated through the building to satisfy the space heating needs for each apartment. Auxiliary heating is provided by three inline gas-fired boilers. The system has three modes of operation. Original cost estimates for provisioning and installation of the solar system are given. DOE

N80-25820# International Business Machines Corp., Gaithersburg, Md.
SOLAR ENERGY PERFORMANCE EVALUATION. ZIEN MECHANICAL CONTRACTORS NO. 1: SINGLE-FAMILY RESIDENCE, MILWAUKEE, WISCONSIN Progress Report, Oct. 1978 - Mar. 1979
Carl L. Werner 1978 67 p refs
(Contract EG-77-C-01-4049)
(SOLAR/1057-79/14) Avail: NTIS HC A04/MF A01

Zien Mechanical Contractors No. 1 is a single-family residence in Milwaukee, Wisconsin. The home has approximately 1304 square feet of conditioned space. The solar energy system consists of two independently controlled systems: one system serves domestic hot water (DHW) preheating; the other is used for space heating and space cooling. Only the space heating and cooling system is described. The system has an array of flat-plate collectors with a gross area of 384 square feet. The array faces south at an angle of 53 degrees to the horizontal. Air is the transfer medium that delivers solar energy from the collector array to storage. Solar energy is stored in a rock bin containing 41,250 pounds of rock located in the basement of the house. The rock bin has 2 inches of polyurethane insulation on the outside walls and fiberglass roll insulation in the ceiling. A heat pump delivers solar energy from storage to a heat exchanger located within an air-handler. Heated air is then blown from the air-handler to the load. When solar energy is insufficient to satisfy the space heating load, an electric resistance heater in the air-handler provides auxiliary energy for space heating. The system has 10 modes of solar operation for space conditioning. The performance of the system for the period October 1978 through March 1979 is described. DOE

N80-25821# Boeing Aerospace Co., Seattle, Wash.
SOLAR PROJECT DESCRIPTION FOR PERL-MACK ENTERPRISES' SINGLE FAMILY RESIDENCES, DENVER, COLORADO
21 Aug. 1979 50 p
(Contracts EG-77-C-01-4049; HUD-H-2372)
(SOLAR/1015-79/50) Avail: NTIS HC A03/MF A01

The Perl-Mack Enterprises Co. solar energy systems, which are installed in a total of 25 single family dwellings located in Denver, Colorado, are described. The 25 dwellings are of three different configurations. Two of the twenty-five dwellings have been fully instrumented for performance monitoring and evaluation since September 1977. All the solar systems are designed to provide approximately 69 percent of the space heating and energy requirements for each dwelling. Solar energy is collected by an array of flat plate collectors having a gross area of 470 square feet. A water-glycol mixture is used as the medium for delivering solar heat from the collection to the storage tank. The storage tank has a total capacity of 945 gallons. A liquid-to-liquid heat exchanger, within the storage tank, transfers the stored heat from the transfer medium to the domestic hot water tank of the house. DOE

N80-25822# Bell Telephone Labs., Inc., Philadelphia, Pa.
WEST CHESTER WORK CENTER: SOLAR SPACE HEATING DEMONSTRATION PROJECT
May 1979 47 p ref
(Contract EY-76-C-02-4048)
(DOE/CS-4048/2; COO-4048-2) Avail: NTIS HC A03/MF A01

The construction stage of an integrated system providing solar energy space heating for 9982 sq ft, newly built, one-story building is described. The building is located at 966 Matlack Street, West Goshen Township, Chester County, Pennsylvania. Functionally, the building consists of two sections: an office and a storeroom. The office section is heated by solar-assisted water-to-air heat pump units. The storeroom section is heated by an air-handing unit, containing a water-to-air coil. Solar energy is expected to provide 62% of the heating load, with the balance provided by a back-up electric boiler. The system includes 1900 active (2112 gross) square feet of flat-plate solar collectors, and a 6000 gallon above ground indoor storage tank. Freeze protection is provided by a gravity drain-down scheme combined with nitrogen pressurization in a closed circuit. DOE

N80-25823# Wisconsin Univ. - Madison. Solar Energy Lab.
SIMULATION AND DESIGN OF SOLAR THERMAL PROCESSES
31 Oct. 1979 16 p refs
(Contract EY-76-S-02-2588)
(COO-2588-T1) Avail: NTIS HC A02/MF A01

Research on simulation using TRNSYS and FCHART methods is described including systems analysis, user services, design procedures, and model validation. DOE

N80-25824# Department of Energy, Washington, D. C. Office of Solar, Geothermal, Electric and Storage Systems.
OCEAN ENERGY SYSTEMS. FISCAL YEAR 1979 Program

Summary Report
1979 284 p refs
(DOE/ET-0118) Avail: NTIS HC A13/MF A01

A review of ocean thermal energy conversion technology, test facilities, and research programs is given; and project summaries for DOE contracts are included. The project summaries list the contractor, contract title and number, funding, and work location and provide a brief description of the project. Also, project summaries for technologies for alternate ocean energy systems employing ocean currents, ocean waves, and salinity gradients are included. The technical status and program plans for each of the alternate technologies are discussed. DOE

N80-25825# General Electric Co., Philadelphia, Pa. Advanced Energy Dept.
SOLAR TOTAL ENERGY PROJECT SHENANDOAH Final Design Report
10 Jan. 1980 340 p
(Contract EG-77-C-04-3985; DE-AC04-77ET-20260)
(ALO-3985-1-Rev-1) Avail: NTIS HC A15/MF A01

A description of the final design for the Solar Total Energy System to be installed at the Shenandoah, Georgia, site of utilization by the Bleyle knitwear plant, is presented. The system is a fully cascaded total energy system design featuring high temperature paraboloidal dish solar collectors with a 235 concentration ratio, a steam Rankine cycle power conversion system capable of supplying 100 to 400 kW(e) output with an intermediate process steam take-off point, and a back pressure condenser for heating and cooling. The design also includes an integrated control system employing the supervisory control concept to allow maximum experimental flexibility. The system design criteria and requirements are presented including the performance criteria and operating requirements, environmental conditions of operation; interface requirements with the Bleyle plant and the Georgia Power Company lines; maintenance, reliability, and testing requirements; health and safety requirements; and other applicable ordinances and codes. DOE

N80-25826# BDM Services Co., Albuquerque, N. Mex.
CONCEPTUAL DESIGN AND ANALYSIS OF A 100 MWe DISTRIBUTED LINE FOCUS SOLAR CENTRAL POWER PLANT Topical Report, 29 Sep. 1978 - 4 May 1979
M. G. Semmens, A. Fong, G. J. Collaros, R. E. Dascher, R. E. Grassberger, D. B. Griego, and T. F. Stueber 1979 327 p
(Contract ET-78-C-03-2073)
(SAN-2073-1) Avail: NTIS HC A15/MF A01

A program to develop the optimum line focus solar central power plant system conceptual design is reported in detail. The approach consisted of a parametric analysis of each of the seven major subsystems: collector, receiver tube, working fluid, heat transport subsystem, energy storage subsystem, electric power generating subsystem, and master control subsystem. Systems analysis and selection of the baseline 100 MWe line focus power plant are described. Detailed performance and cost summaries are included. DOE

N80-25827# Argonne National Lab., Ill. Office of Program Management Support.
WORLD ENERGY DATA SYSTEM (WENDS). VOLUME 1: COUNTRY DATA, AF-CO
Jun. 1979 345 p refs 11 Vol.
(Contract W-31-109-eng-38)
(ANL/PMS-79-2-Vol-1) Avail: NTIS HC A15/MF A01

The World Energy Data System contains organized data on those countries and international organizations that may have critical impact on the world energy scene. Country data on Afghanistan, Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Bolivia, Brazil, Burma, Canada, China, and Colombia are included in volume 1. The following topics are covered for most of the countries: economic, demographic, and educational profiles; energy exports, imports of energy supplies; environmental considerations; power production facilities; energy industries; commercial applications of energy; research and development activities of energy; and international activities. DOE

N80-25828# Argonne National Lab., Ill. Office of Program Management Support.
WORLD ENERGY DATA SYSTEM (WENDS). VOLUME 2: COUNTRY DATA, CZ-KS
Jun. 1979 361 p refs 11 Vol.
(Contract W-31-109-eng-38)
(ANL/PMS-79-2-Vol-2) Avail: NTIS HC A16/MF A01

The World Energy Data System contains organized data on those countries and international organizations that may have critical impact on the world energy scene. Country data on Libya, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Niger, Nigeria, Norway, Pakistan, Peru, Philippines, Poland, and Portugal are presented. The following topics are covered for most of the countries: economic, demographic, and educational profiles; energy policy; indigenous energy resources and uses; forecasts demand, exports, imports of energy supplies; environmental considerations of energy supplies; power production facilities; energy industries; commercial applications of energy; research and development activities of energy; and international activities. DOE

N80-25829# Argonne National Lab., Ill. Office of Program Management Support.
WORLD ENERGY DATA SYSTEM (WENDS). VOLUME 3: COUNTRY DATA, LY-PO
Jun. 1979 364 p refs
(Contract W-31-109-eng-38)
(ANL/PMS-79-2-Vol-3) Avail: NTIS HC A16/MF A01

The World Energy Data System contains organized data on those countries and international organizations that may have critical impact on the world energy scene. Included in this volume, volume 2, are Czechoslovakia, Denmark, Egypt, Finland, France, Germany(East), Germany (West), Greece, Guinea, India, Indonesia, Iran, Italy, Japan, and Korea (South). The following topics are covered for most of the countries; economic, demographic, and educational profiles; energy policy; indigenous energy resources and uses; forecasts; demand, exports, imports of energy supplies; environmental considerations of energy use; power production facilities; energy industries; commercial applications of energy; research and development activities of energy; and international activities. DOE

N80-25830# Argonne National Lab., Ill. Office of Program Management Support.
WORLD ENERGY DATA SYSTEM (WENDS). VOLUME 4: COUNTRY DATA, SG-YO
Jun. 1979 407 p refs 11 Vol.
(Contract W-31-109-eng-38)
(ANL/PMS-79-2-Vol-4) Avail: NTIS HC A18/MF A01

The World Energy Data System contains organized data on those countries and international organizations that may have critical impact on the world energy scene. Included in this volume are Senegal, South Africa, Soviet Union, Spain, Sweden, Switzerland, Taiwan, Tanzania, Thailand, Turkey, United Kingdom, United States, Upper Volta, Venezuela, and Yugoslavia. The following topics are covered for most of the countries; economic, demographic, and educational profiles; energy policy; indigenous energy resources and uses; forecasts, demand, exports, imports of energy supplies; environmental considerations of energy supplies; power production facilities; energy industries; commercial applications of energy; research and development activites of energy; and international activities. DOE

N80-25831# Argonne National Lab., Ill. Office of Program Management Support.
WORLD ENERGY DATA SYSTEM (WENDS). VOLUME 5: INTERNATINAL ORGANIZATION DATA
Jun. 1979 156 p refs 11 Vol.
(Contract W-31-109-eng-38)
(ANL/PMS-79-2-Vol-5) Avail: NTIS HC A08/MF A01

The World Energy Data System (WENDS) contains organized data on those countries and international organization that may have critical impact on the world energy scene. WENDS has acquired and organized information on the following energy-related organizations: Asian Development Bank; European Community; InterAmerican Development Bank; International Atomic Energy Agency; International Energy Agency; Nuclear Energy Agency; United Nations; and World Bank. Within each organization grouping most of the following topics are addressed; organization background, government background, energy background (energy

policy and objectives), energy research and development activities, and international activities. DOE

N80-25832# Teledyne Energy Systems, Timonium, Md.
SELENIDE ISOTOPE GENERATOR FOR THE GALILEO MISSION. HEAT PIPE ATTACHMENT TECHNOLOGY Final Report
Jul. 1979 56 p
(Contract DE-AC01-78ET-33009)
(TES-33009-45) Avail: NTIS HC A04/MF A01

The development of an optimum joining method for attaching copper/water heat pipes to an aluminum alloy (6061-T6) radiator and housing for the SIG/Galileo program is described. DOE

N80-25833# Teledyne Energy Systems, Timonium, Md.
SELENIDE ISOTOPE GENERATOR FOR THE GALILEO MISSION. GIG/GALILEO HERMETIC RECEPTACLE TEST PROGRAM Final Report
Sidney Roedel Jun. 1979 159 p
(Contract DE-AC01-78ET-33009)
(TES-33009-47) Avail: NTIS HC A08/MF A01

The purpose of the receptacle test program was to test various types of hermetically sealed electrical receptacles and to select one model as the spaceflight hardware item for SIG/Galileo thermoelectric generators. The design goal of the program was to qualify a hermetic seal integrity of equal to or less than 1 x 10 to the 9th power std cc He/sec-atm at 400 f(204 C) and verify a reliability of 0.95 at a 50% confidence level for a flight mission in excess of 7 years. DOE

N80-25834# Teledyne Energy Systems, Timonium, Md.
SELENIDE ISOTOPE GENERATOR FOR THE GALILEO MISSION. SIG THERMAL INSULATION TESTS EVALUATION
Jun. 1979 60 p
(Contracts ET-78-C-01-2865)
(TES-33009-50) Avail: NTIS HC A04/MF A01

Since the SIG program required the use of very high performance thermal insulation materials in rather severe thermal and environmental conditions, a thorough screening and testing program was performed. Several types of materials were included in the preliminary survey. Most promising were oxide and carbonaceous fibrous insulations, oxide and carbonaceous foamed materials, and multilayer materials with both powder and cloth spacers. The latter were only viable for the vacuum option. In all, over one hundred materials from more than sixty manufacturers were evaluated from literature and manufacturers' data. The list was pared to eighteen candidates in seven basic types, i.e., fibrous microporous SiO_2, fibrous SiO_2/Al_2O_3, fibrous ZrO_2 fibrous carbon, foamed SiO_2, foamed carbon, and multilayer. Test results are presented. DOE

N80-25835# Teledyne Energy Systems, Timonium, Md.
SELENIDE ISOTOPE GENERATOR FOR THE GALILEO MISSION. SIG HERMETIC BIMETAL WELD TRANSITION JOINT Final Report
W. J. Barnett Aug. 1979 79 p
(Contracts ET-78-C-01-2865)
(TES-33009-51) Avail: NTIS HC A05/MF A01

The successful development of the commercial 6061-T6561/Silver/304/L explosive clad plate material as a bimetal weld transistion joint material, as described herein, satisfies all SIG/Galileo design requirements for hermetic weld attachment of stainless steel subassemblies to aluminum alloy generator housing or end cover structures. The application of this type weld transition joint to the hermetic attachment of stainless steel shell connectors is well developed and tested. Based on on-going life tests of stainless steel receptacle/ bimetal ring attachment assemblies and metallurgical characterization studies of this transition joint material, it appears evident that this transition joint material has more than adequate capability to meet the 250 to 300 F and 50,000 hr. design life of the SIG/Galileo mission. Its extended life temperature capability may well approach 350 to 400 F. DOE

N80-25836# Westinghouse Electric Corp., East Pittsburgh, Pa.
DESIGN STUDY AND ECONOMIC ASSESSMENT OF MULTI-UNIT OFFSHORE WIND ENERGY CONVERSION SYSTEMS APPLICATIONS. VOLUME 4: METEOROLOGICAL AND OCEANOGRAPHIC SURVEYS Final Report
14 Jun. 1979 344 p refs
(Contracts EX-76-C-01-2330; EI(49-18)-2330)
(WASH-2330-78/4-Vol-4) Avail: NTIS HC A15/MF A01

The results are presented of a survey of the meteorology and oceanography of the United States offshore as they pertain to the design, cost, emplacement, operation and maintenance of offshore wind energy conversion systems (OWECS). This report is intended to define the environment in which OWECS are to be considered. DOE

N80-25837# Westinghouse Electric Corp., East Pittsburgh, Pa. Advanced Systems Technology Div.
DESIGN STUDY AND ECONOMIC ASSESSMENT OF MULTI-UNIT OFFSHORE WIND ENERGY CONVERSION SYSTEMS APPLICATION. VOLUME 3: SYSTEM ANALYSIS Final Report
14 Jun. 1979 192 p refs
(Contract EX-76-C-01-2330)
(WASH-2330-78/4-Vol-3) Avail: NTIS HC A09/MF A01

Optimum offshore wind energy conversion systems are described. The cost and performance of these systems were developed for a variety of conditions and the tradeoff between cost and energy production was made of the wide range of scenarios considered. The impact of the many design parameters on the major subsystems are briefly reviewed and the interactions which exist between subsystems are discussed. In particular, a section is devoted to dynamic interactions which might exist between the wind turbine generator plant and the platform. DOE

N80-25838# Westinghouse Electric Corp., East Pittsburgh, Pa.
DESIGN STUDY AND ECONOMIC ASSESSMENT OF MULTI-UNIT OFFSHORE WIND ENERGY CONVERSION SYSTEMS APPLICATION. VOLUME 2: APPARATUS DESIGNS AND COSTS Final Report
14 Jun. 1979 310 p refs
(Contracts EX-76-C-01-2330; EI(49-18)-2330)
(WASH-2330-78/4-Vol-2) Avail: NTIS HC A14/MF A01

Parametric designs and companion cost functions are presented for each major component of an offshore wind energy conversion system (OWECS). These are: (1) the support platforms; (2) the wind turbine generated (WTG) plants; and (3) the electrical energy collection and transmission system including (4) substations. A backup hydrogen energy delivery system for extremely remote or deep water sites was also evaluated. Costs are presented for fabricating, transporting, installing, operating, and maintaining each of these components. DOE

N80-25839# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR TECHNOLOGY APPLICATION TO ENHANCED OIL RECOVERY
P. deLeon, K. C. Brown, J. W. Margolis, and L. H. Nasr Dec. 1979 101 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-352-392) Avail: NTIS HC A06/MF A01

Solar energy systems which generate steam for thermal enhanced oil recovery are discussed. Six solar technologies are evaluated and two parabolic troughs and central receivers are selected for closer study. The legal and environmental issues attending solar enhanced oil recovery are analyzed. The petroleum producing companies' preferences and requirements are discussed. Alternative means of financing solar enhanced oil recovery are addressed. DOE

N80-25840# Delaware Univ., Newark. Coll. of Engineering.
THEORY OF THIN-FILM PHOTOVOLTAICS. NON-IDEAL DIODE FACTORS
K. W. Boeer 1979 23 p refs
(Contract DE-AC01-79ET-23103)
(DOE/ET-23103; TR-3) Avail: NTIS HC A02/MF A01

It is shown that non-ideal diodes with an A-factor in the exponent larger than two can be explained when the junction recombination starts to saturate. In photovoltaic cells in which the density of minority carriers can be varied independent of the bias voltage, this behavior becomes transparent and is used as an example for the proposed models. DOE

N80-25841# Institute of Gas Technology, Chicago, Ill.
BENEFICIAL USE OF REJECTED HEAT FROM ELECTRIC POWER PLANTS Final Summary Report
Robert W. Porter Aug. 1979 17 p refs
(Contract EC-77-S-02-4531)
(COO-4531-9) Avail: NTIS HC A02/MF A01

The in situ beneficial uses of rejected heat from steam-electric power plants are evaluated. Applications, which include direct discharge into a municipal water supply, interaction with wastewater treatment, and open field irrigation, were examined. In each case, a thermal and economic systems analysis was performed and operational, legal, and other problems were assessed. In the case of the municipal water supply, the savings in cost of closed-cycle cooling and water-heater energy appear to offset operational problems in the water supply and may be sufficient to justify public acceptance. A number of more advanced wastewater treatment processes would benefit from dilution with a portion of condenser discharge. The treated mixture would serve as makeup for a smaller modified closed cycle cooling system and the balance would constitute a water product. Unfortunately, open-field irrigation does not seem feasible due to the large land areas required. DOE

N80-25842# Spire Corp., Bedford, Mass.
AMORPHOUS SILICON SOLAR CELLS BY HYDROGEN IMPLANTATION Quarterly Report, 1 Jan. - 31 Mar. 1979
A. R. Kirkpatrick and A. A. Melas Aug. 1979 24 p
(Contract DE-AC03-79ET-23042)
(SAN-3042-1; QR-1) Avail: NTIS HC A02/MF A01

The program to investigate applications of ion implantation to preparation of amorphous silicon material and cell devices was initiated. Emphasis was placed upon establishing a number of special ion implantation capabilities needed in order to conduct the program. Adequate beams of all ions of initial interest were made available over wide ion energy range. Special fixtures to provide active sample cooling and required area masking were produced. Implantation environments were experimentally verified. Analytical studies were conducted to insure that transient thermal effect problems could be avoided during high rate implantations to be employed. Ranges of available implantation effects for H-1(+), B-11(+), O-16(+), F-19(+), Si-28(+), P-31(+), and Ar-40(+) into silicon were examined. A cell device test structure was selected to be employed as a primary investigation vehicle for initial evaluation of implantation effects. R.E.S.

N80-25843# Varian Associates, Palo Alto, Calif.
NOVEL SOLAR CELL CONCENTRATOR PHOTOVOLTAIC CONVERTER SYSTEM Final Report
L. W. James and A. VanderPlas Dec. 1979 91 p refs Prepared for Sandia Labs., Albuquerque, New Mex.
(Contract EY-76-C-04-0789)
(SAND-79-7048) Avail: NTIS HC A05/MF A01

Attainment of photovoltaic conversion efficiencies greater than 25% to 30% thought necessary to make concentrator photovoltaics economical, seems possible if the soalr spectrum is more efficiently used by splitting the spectrum and using solar cells of different bandgaps,. For initial work on multi-bandgap concentrator solar cells, the spectrum was split by an optical filter which transmits light above 1.6 eV and below 1.1 eV and reflects light between 1.1 and 1.6 eV. Theoretical modeling of possible conversion efficiencies led to the choice of the filter bandpass energies and practical solar cell fabrication considerations have led to the choice of silicon and the Al(x) Ga(1-x)As system for initial development work. Special silicon concentrator solar cells with a p(+):n(-):n(+) structure designed for this application and have attained apparent cell conversion efficiencies of 16.2% at a current ratio of 455 suns. DOE

N80-25844# Motorola, Inc., Phoenix, Ariz. Solar Energy Dept.
THIN FILM POLYCRYSTALLINE SILICON SOLAR CELLS Quarterly Report, 1 Apr. - 30 Jun. 1979
K. R. Sarma, M. J. Rice, R. Legge, R. W. Gurtler, and W. C. Ramsey 30 Jun. 1979 72 p refs
(Contract ET-78-C-03-2207)
(SAN-2207-3) Avail: NTIS HC A04/MF A01

The effects of molybdenum substrate smoothness on the shear separation process were investigated. By Auger analysis of the substrates, shear separation was found to occur in the silicon film very near the MoSi2-Si interface. A moving substrate EBD system was designed and fabricated. Initial experiments were performed to determine the optimum resistivity for high efficiency cells and the effects of substrate temperature during deposition and of multiple gettering cycles on solar cell efficiency. Substrate temperatures between 1050 C and 1150 C did not appear to influence cell efficiency parameters. Because of the limited number of experiments performed to date, the optimum doping level and the benefits of multiple gettering cycles could not be conclusively determined. DOE

N80-25845# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MATHEMATICAL MODELING OF THE LITHIUM ALUMINUM, IRON SULFIDE BATTERY Ph.D. Thesis
Richard Pollard Dec. 1979 167 p refs
(Contract W-7405-eng-48)
(LBL-10197) Avail: NTIS HC A08/MF A01

The LiAl/LiCl,KCl/FeS high temperature battery is a candidate for off-peak energy storage and for electric vehicle propulsion. A mathematical model is presented which is able to predict the operational characteristics of the cell and obtain pertinent information for its design and optimization. The theoretical results show many of the trends in behavior observed experimentally. The effects of state of charge, initial electrolyte composition, cell temperature, and current density are presented, and factors that can limit cell performance are identified. The influence of a period of relaxation between the end of discharge and the subsequent charge was also investigated. Furthermore, a separate, analytic treatment of porous electrodes was developed in order to clarify the nature of the highly nonuniform initial reaction distributions that are obtained with high exchange current densities. DOE

N80-25846# Montana Energy and MHB Research and Development Inst., Inc., Butte.
HIGH-TEMPERATURE FUEL CELL RESEARCH AND DEVELOPMENT Annual Technical Status Report, 1 Oct. 1978 - 30 Sep. 1979
30 Sep. 1979 25 p
(Contracts EC-77-C-03-1485; DE-AC03-77ET-11320)
(SAN-1485-T1) Avail: NTIS HC A02/MF A01

Materials which are chemically and physically stable in molten carbonate fuel cell electrolyte at 600 to 700 C were identified. Fibers of the identified materials were than prepared and characterized to determine the stability of the fibers in the molten carbonate electrolyte. DOE

N80-25847# Institute of Gas Technology, Chicago, Ill.
FUEL CELL RESEARCH ON SECOND-GENERATION MOLTEN-CARBONATE SYSTEMS Technical Report, 1 Oct. 1978 - 30 Jun. 1979
Oct. 1979 305 p refs
(Contract EM-78-C-03-1735)
(SAN-11276-1) Avail: NTIS HC A14/MF A01

Activities toward the development of a cell package containing cost effective cell components, having a cell performance satisfying utility requirements (125 W/ft 2 at 0.85 V using low Btu fuel gases), and having the capability of repeated thermal cycling with a pressure differential between the anode and the cathode are described. Structural analysis studies to identify the magnitude and the distribution of stress levels in the cell package show that differences in thermal expansion and mechanical properties of the cell components, bonding of the electrolyte tile to other cell components, and the cell design (location of supports and gas distribution channels) are extremely important. Efforts to minimize the phase transformations of the three crystalline forms of LiAlO2 during cell operation via anion or cation doping of the LiAlO2 for the purpose of stabilizing the LiAlO2 surface area at some acceptable level are showing only limited success. Both baseline and development cell components were tested in laboratory and in bench scale cells. DOE

N80-25848# Montana Energy and MHB Research and Development Inst., Inc., Butte.
HIGH TEMPERATURE FUEL CELL RESEARCH AND DEVELOPMENT Final Technical Status Report, Jun. 1977 - Sep. 1978

J. J. Rasmussen and R. Guidotti 15 Oct. 1978 253 p refs
(Contract EC-77-C-03-1485)
(SAN-1485-2) Avail: NTIS HC A12/MF A01

Ceramic materials with properties which made them potential candidates for use in molten-carbonate fuel cell tiles or electrodes were investigated. Thirteen compositions were tested statically at 1000 K in a Li2CO3-K2CO3 bath under a dry CO2 atmosphere. Four of the materials tested showed severe degradation reactions in the molten carbonate. A low temperature process for forming small diameter, high aspect ratio ceramic fibers for fuel cell use was developed. Results of a computer study on the thermodynamic analysis of fuel cell materials are discussed. The magnetohydrodynamic materials with potential use for fuel cell applications were surveyed. Laboratory facilities were established to conduct research on interfacial diffusion processes which could be detrimental to successful long term operation of the solid-electrolyte fuel cell. A variety of physical and chemical techniques were examined for the preparation of high density substituted LaCrO3 which was one component of a diffusion couple with Y2O3-stabilized ZrO2. Hydrolysis of a mixed metal nitrate solution with urea produced the most reactive powder. A final theoretical density of almost 98% was attained in cold pressed sintered discs of this material. DOE

N80-25848# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
EVALUATION OF RESIDENTIAL BUILDING ENERGY PERFORMANCE STANDARDS
Mark D. Levine, David B. Goldstein, Arthur H. Lokmanhekim, and Arthur H. Rosenfeld Dec. 1979 37 p refs Presented at Conf. on Thermal Performance of the Exterior Envelopes of Buildings, Orlando, Fla., 3-5 Dec. 1979
(Contract W-7405-eng-48)
(LBL-9816; CONF-791233-2) Avail: NTIS HC A03/MF A01

The development and analysis of energy performance standards for residential buildings in the United States is described. The approach involves an assessment of the economic costs and benefits of alternative standards and provides quantitative estimates of the reduction of energy use resulting from the implementation of standards. The sensitivities of building energy use to design parameters of buildings - including size, orientation, aspect ratio, basement type, window area, and construction material - are assessed. The DOE-2 building energy utilization analysis program was used to evaluate the heating and cooling loads of residential buildings. Residencial buildings were simulated in ten weather climates using hourly weather data with a variety of energy conservation measures. DOE

N80-25850# Sperry Univac, St. Paul, Minn.
SOLAR COLLECTOR STUDIES FOR SOLAR HEATING AND COOLING APPLICATIONS Technical Progress Report, 18 Sep. 1978 - 18 Mar. 1979
S. O. Jensen, J. E. Kovacic, and J. H. Anderson (Scientific Sunsource Systems) 10 Mar. 1979 56 p refs
(Contract EM-78-C-04-5355)
(ALO-5355-T1) Avail: NTIS HC A04/MF A01

A summary of the literature, especially patent teachings pertaining to black fluid solar collectors, is given. Laboratory tests to determine the suspension stability of various carbon types in water/ethylene glycol are reported. The suspensions were aged at 160 F for 2000 hours and at -15 F for 500 hours. Tests to date demonstrate that colloidal carbon with Zanflow gum as the suspending agent gave excellent, stable suspensions even after evaporation and resuspension with water/ethylene glycol 50:50 solution. It is suggested that the suspending agent interacts with electrical charges on the carbon particles to prevent agglomeration. DOE

N80-25851# American Science and Engineering, Inc., Cambridge, Mass.
DEVELOPMENT OF A SECOND-GENERATION CONCENTRATING TRACKING SOLAR COLLECTOR Technical Progress Report, 28 Dec. 1978 - 19 Jun. 1979
William D. Antrim, Jr. 16 Aug. 1979 29 p
(Contract EM-78-C-04-4275)
(ASE-4480) Avail: NTIS HC A03/MF A01

A second generation concentrating tracking solar collector was developed. The approach combines an array of parabolic trough mirror concentrators each combined with a variation of the cylindrical blackbody receiver to provide a collector with a minimum concentration ratio of ten. The design of the prototype collector was completed, engineering model hardware produced, tested, and the design iterated. The collector design and some of the model hardware used to develop certain design features are described in detail. DOE

N80-25852# California Univ. at Berkeley. Sanitary Engineering Research Lab.
SOLAR ENERGY CONVERSION THROUGH BIOPHOTOLYSIS Annual Report, 1 Apr. 1978 - 31 Mar. 1979
J. R. Benemann, M. A. Murry, P. C. Hallenbeck, K. Miyamoto, A. G. Olafsen, D. J. Esteva, and L. V. Kochian 1 May 1979 236 p refs
(Contract EY-76-S-03-0034)
(SAN-0034-239-T1; AR-3) Avail: NTIS HC A11/MF A01

The state-of-the-art of biophotolysis was reviewed and a bioengineering analysis carried out. The conclusions were that practical biophotolysis systems are feasible; however, they will require, in most cases, relatively long-term R and D. The biophotolysis system developed, utilizing heterocystous blue-green algae, was demonstrated both indoors and outdoors with a model converter system using the heterocystous blue-green alga Anabaena cylindrica. Maximal light energy conversion efficiencies were 2.5 percent indoors and about 0.2 percent outdoors, averaged for periods of about two weeks. Achievement of such rates required optimization of N2 supply and culture density. DOE

N80-25853# Solarex Corp., Rockville, Md.
PHOTOVOLTAIC MECHANISMS IN POLYCRYSTALLINE THIN FILM SOLAR CELLS Quarterly Technical Progress Report, Apr. - 30 Jun. 1979
George Storti, Scott Johnson, H. C. Lin, and R. W. Armstrong 30 Jun. 1979 32 p refs Prepared in cooperation with Maryland Univ., College Park
(Contract ET-78-C-01-3413)
(DSE-3413-T2; QTPR-3) Avail: NTIS HC A03/MF A01

The vertical junction effect in polysilicon solar cells (due to dopant penetration along grain boundaries) was investigated using a cylindrical grain model. The model shows that for small grain radii the short circuit current can increase above the single crystal value if the grain boundaries collect carriers and that the short-circuit current approaches the single crystal value as the grain size increases. Dark I-V characteristics were measured and illuminated characteristics are projected for each of the diodes. The diode characteristics are given together with SEM micrographs of the diodes and the effect of areal inhomogemetry was investigated. The relative orientations of adjacent crystal grains and the nature of the boundaries between grains were studied by X-ray diffraction, optical microscopy and SEM methods. Orientation data is presented along with electron channelling patterns obtained from individual grains. A conclusion is drawn on the origin of sinuous grain boundaries. DOE

N80-25854# Solarex Corp., Rockville, Md.
PHOTOVOLTAIC MECHANISMS IN POLYCRYSTALLINE THIN FILM SOLAR CELLS Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1979
George Storti, Scott Johnson, H. C. Lin (Maryland Univ., College Park), and R. W. Armstrong (Maryland Univ., College Park) 30 Sep. 1979 51 p refs
(Contract ET-78-C-01-3413)
(DSE-3413-T3; QTPR-4) Avail: NTIS HC A04/MF A01

A detailed model of the vertical junction effect was generated which investigates both the increase in light generated current due to enhanced collection at the grain boundary and the increase in dark current due to the increased junction area. Results show that there is an overall increase in the cell's maximum power; however, the increase in power is negligible for grain widths exceeding a few tenths of a millimeter. Solar cells were fabricated on a longitudinal section of cast polysilicon which was analyzed crystallographically by means of X-ray diffraction patterns. Special crystallographic orientation relationships were identified for the relative orientations of adjacent grains and for the alignment of their boundary interfaces along certain planar segments. The dark I-V characteristics of the polysilicon cells

were dominated by recombination within the space-charge region. DOE

N80-25855# Solar Turbines International, San Diego, Calif.
DEVELOPMENT OF POLYIMIDE MATERIALS FOR USE IN SOLAR ENERGY SYSTEMS Semiannual Progress Report, 1 Aug. 1978 - 31 Jan. 1979
A. L. Wilcoxson, U. A. Sorathia, and J. Gagliani 1979 39 p refs
(Contracts EM-78-C-04-5305)
(DOE/CS-35305/T1; SR-79-R-4650-09) Avail: NTIS HC A03/MF A01

Two separate and distinct products were studied, a lightweight flexible insulating foam and a high density rigid, load bearing insulating foam. These products are derived from a polyimide resin. A critical characterization criteria was established in the form of environment exposure resistance. The foams were evaluated on the basis of this direct exposure test. Studies initiated to improve the resistance included additive studies, using reinforcements and uv absorbers, and postcure studies. The various formulations were also screened on the basis of humidity resistance. On the basis of testing conducted, four different resin formulations at a foam density of approximately 16 kg/cu m are meeting minimum requirements. The rigid foam was optimized through a glass reinforcement study and a process parameter study. The result was an optimized glass strand/microballoon reinforced foam which meets the tested property goals at a density of approximately 240 kg/cu m. DOE

N80-25856# Sandia Labs., Livermore, Calif.
SILVER DETERIORATION IN SECOND SURFACE SOLAR MIRRORS
Victor P. Burolla and Susan L. Roche Jan. 1980 40 p refs
(Contract EY-76-C-04-0789)
(SAND-79-8276) Avail: NTIS HC A03/MF A01

The suitability of various heliostat mirror module designs for large solar central power systems, is examined with respect to the service life of the reflective surface. Observations on several module designs reveal significant deterioration of the silvered surface in an unexpectedly short time span. Information on the extent and nature of the deterioration noticed on several mirror module designs, on the accelerated tests designed to simulate field deterioration, on the potential design solutions available, on the parameters necessary for conducting useful accelerated weathering tests, and on the nature of commercially prepared mirrors is presented. DOE

N80-25857# Sandia Labs., Albuquerque, N. Mex.
USE OF THIN GLASS REFLECTORS FOR SOLAR CONCENTRATORS
R. H. Marion 1980 12 p refs
(Contract EY-76-C-04-0789)
(SAND-80-0109C; CONF-800220-1) Avail: NTIS HC A02/MF A01

Elastically deforming thin glass (thickness = 0.13 to 0.80 mm) provides an alternate method of forming a curved glass reflector which can eliminate some of the disadvantages of thicker glass. A concept is described where silvered thin glass is bonded to a steel backing to form a laminate with a reflectance greater than 93%. Subsequent bending of the flat reflector laminate to a concentrating profile produces compressive stresses throughout the glass if the laminate is properly designed. These compressive stresses enhance fracture resistance and the lamination provides protection for the silver. The design of the laminate is outlined for 0.25 and 0.51 mm thickness glass and fabrication procedures are discussed. Thermal/humidity cycling hail impact, bond strength measurement and reflectance results are presented which demonstrate the performance capabilities of this reflector laminate concept. DOE

N80-25858# Sandia Labs., Albuquerque, N. Mex.
SOLARIZATION OF HELIOSTAT GLASSES
J. Vitko, Jr. and J. E. Shelby Dec. 1979 26 p refs Presented at the Solar Reflective Mater. Workshop, San Francisco, 12-14 Feb. 1980
(Contracts EY-76-C-04-0789; DE-AC04-79DP-00789)
(SAND-79-8754) Avail: NTIS HC A03/MF A01

A solar induced decrease in FE(2+) absorption in heliostat glasses from the solar furnace at Odeillo, France, has been observed. This decrease occurs throughout the sampled (not just at the exposed surface) and is of sufficient magnitude to result in an increase of 2.5% in solar transmittance in a period of nine years. Optical and ESR studies did not detect a corresponding increase in FE(3+) concentration. The implication of these results on a microscopic model for the observed solarization is discussed. Solar simulation studies produced effects of magnitude and sign similar to those observed in the field exposed samples, and appear to offer an attractive means for screening samples for solarization tendencies. DOE

N80-25859# Sandia Labs., Albuquerque, N. Mex.
MAGMA ENERGY: A FEASIBLE ALTERNATIVE?
J. L. Colp 1979 21 p refs Presented at Conf. on Long-Term Energy Resources, Montreal, Canada, 3 Dec. 1979
(Contract EY-76-C-04-0789)
(SAND-80-0309C; CONF-791216-2) Avail: NTIS HC A02/MF A01

A program to investigate the scientific feasibility of extracting energy directly from deeply buried circulating magma sources is described. The following program tasks are discussed: sources location and definition, source tapping, magma characterization, magma/material compatibility, and energy extraction. DOE

N80-25860# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
CLEANING AGENTS AND TECHNIQUES FOR CONCENTRATING SOLAR COLLECTORS
V. L. Morris 1980 65 p refs Presented at 2nd Solar Reflective Mater. Workshop, San Francisco, 12 Feb. 1980
(Contract EY-76-C-04-0789)
(SAND-80-7005C; CONF-800220-2) Avail: NTIS HC A04/MF A01

Tests were conducted to determine the nature of the soil which is irreversibly deposited on solar collectors during environmental exposure. Mehods of removing this soil were investigated. The mechanism of attachment of the soil to the surface was determined as a potential aid to cleaning agent formulation. Reflector specimens were environmentally exposed at several industrial sites. Three types of reflector surfaces were studied: second surface silvered glass, aluminized FEK-244 film on aluminum substrate, and RTV 670 on aluminum. Cleaning procedures were evaluated by microscopic examination of the solid surfaces before and after cleaning by measurement of specular reflectance. The effect of local environmental degradation specific to an industrial process on solar collector surfaces was investigated. DOE

N80-25861# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
HYBRID THERMAL STORAGE WITH WATER Final Report, 1 Sep. 1977 - 10 Nov. 1978
30 Sep. 1979 328 p refs
(Contract EG-77-C-02-4480)
(ESG-DOE-13259) Avail: NTIS HC A15/MF A01

After completion of a state-of-the-art survey, four distinct hybrid system concepts were developed. Two computer codes were developed to model the behavior of hybrid storage devices. A systems model code was also developed to compute the performance of solar heating systems. The systems model yielded results in excellent agreement with TRNSYS code, but required only 5% of the computer time to complete a 1 year simulation. Designs for a unique water tank in a bed of gravel system, using an annular tank, were developed. Three sizes of this design were estimated to be applicable to the majority of residential applications in the United States. It was estimated that the use of these designs could result in a reduction in total cost of a solar heating system of up to 21%. It must be noted that the large uncertainties in the experimental data on which the anlysis used in this study was based, and the uncertainties involved in the heat transfer modeling of hybrid systems, are significantly larger than the performance benefits indicated. DOE

N80-25862# Department of Energy, Washington, D. C.
ENVIRONMENTAL DEVELOPMENT PLAN: SOLAR AGRICULTURAL AND INDUSTRIAL PROCESS HEAT

Sep. 1979 41 p refs
(DOE/EDP-0033) Avail: NTIS HC A03/MF A01

The Environmental Development Plan system which provides a common basis for planning, managing, and reviewing the environmental aspects of solar agricultural and industrial process heat is described. Solar heating for fossil fuel generated process heat is considered along with shelter heating, drying, process hot water, process steam, and cooling and refrigeration. Materials development, system analysis, and component development and testing are among the factors discussed. R.G.D.

N80-25863# Completion Technology Co., Houston, Tex.
PERFORMANCE EVALUATION OF MAGMA POWER COMPANY'S REINJECTION WELL NO. 46-7 AT THE EAST MESA KGRA, CALIFORNIA
R. M. Jorda Feb. 1980 35 p refs Sponsored in part by Sandia Labs., Albuquerque, N. Mex.
(Contract EY-76-C-04-0789)
(SAND-79-7127) Avail: NTIS HC A03/MF A01

Water has cooled to 100 F to simulate total heat extraction and then tested using membrane filter flow procedures. The cooled water contains particles which are in the high colloid size range, and formation impairment by these particles is unlikely. There is evidence that acid soluble corrosion products and calcium compounds constitute about two thirds of the particulates, and that the acid insoluble residue contains precipitated silica, insoluble corrosion products, and possibly formation fines carried in the produced water. Under stabilized conditions, the suspended solids content of the water is less than 2 parts per million. HOwever, during the frequent production well start ups, a higher concentration of suspended solids is carried in the produced water and into the injection well, conceivably augmenting fill in the injector. But most likely, fill occurs when the injection well surges during shut-downs, because of inadequate sand control in the well completion. At the time of the test, the injection well was found to be severely impaired. DOE

N80-25864# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
COMPARATIVE PERFORMANCE OF TWO TYPES OF EVACUATED TUBULAR SOLAR COLLECTORS IN A RESIDENTIAL HEATING AND COOLING SYSTEM Final Report, 1 Oct. 1977 - 30 Sep. 1978
G. O. G. Loef and W. F. Duff Sep. 1979 16 p
(Contract EY-76-S-02-2577)
(COO-2577-19) Avail: NTIS HC A02/MF A01

Two types of evacuated tubular solar collectors were operated in space heating, cooling, and domestic hot water heating systems in Colorado State University Solar House 1. A flat absorber plate inside a single walled glass tube is used in the Corning design, whereas heat is conducted through a single glass wall to an external heat exchanger plate in the Philips collector. The respective aperture areas are 50.0 sq m and 44.7 sq m. Since system designs and conditions of operation were not identical, efficiencies and energy deliveries of the two evacuated tubular collectors should not be compared without recognition of these factors. But in comparison with conventional flat plate collectors, both types show substantially reduced heat losses and improved efficiency. DOE

N80-25865# Battelle Pacific Northwest Labs., Richland, Wash.
LONG-TERM SUPPLY CURVES FOR GEOTHERMAL ENERGY: THE IMPACTS OF TECHNOLOGY
L. L. Fassbender and C. H. Bloomster Jan. 1980 94 p refs
(Contract EY-76-C-06-1830)
(PNL-3072) Avail: NTIS HC A05/MF A01

Near term and long term supply curves are presented for electric applications of geothermal energy. The GEOCOST model was used to determine the present and future energy production costs for identified high temperature and intermediate temperature hydrothermal resources. The long term supply curves illustrate the potential shifts in the near-term supply curve which would result from certain technology improvements currently being pursued. Curves were drawn to show the impacts of individual technology improvements and also to show the cumulative impacts of combinations of technological advances expected to be achieved by 1982 and 1985. Successful completion of all the programs evaluated would result in a cumulative cost reduction of $90 billion (not discounted) in electrical generating costs from the identified hydrothermal resources. DOE

N80-25866# Argonne National Lab., Ill. Energy and Environmental Systems Div.
RELIABILITY AND MAINTAINABILITY EVALUATION OF SOLAR COLLECTOR AND MANIFOLD INTERCONNECTIONS
J. A. Mavec, R. Wolosewicz, A. Clark, P. Wang, and P. S. Chopra Mar. 1979 50 p refs
(Contract W-31-109-eng-38)
(SOLAR/0902-79/70; ANL/SDP/TM-79-4) Avail: NTIS HC A03/MF A01

The problem associated with the interconnection devices currenty in use at demonstration sites were examined. The nature and causes of interconnection-related failures are presented, together with the corrective actions that were taken. Design criteria for interconnections in solar-energy systems were developed, and a number of guidelines are provided to assist designers in avoiding interconnection difficulties. DOE

N80-25867# Argonne National Lab., Ill.
TWO-TANK SEASONAL STORAGE CONCEPT FOR SOLAR SPACE HEATING OF BUILDINGS
B. K. Cha, D. W. Connor, and R. O. Mueller 1979 15 p refs Presented at the APS Electron and Atomic Phys. Meeting, Houston, Tex., 10-12 Dec. 1979
(Contract W-31-109-eng-38)
(CONF-791226-2) Avail: NTIS HC A02/MF A01

An analysis of a novel two tank water storage system is presented, consisting of a large primary water tank for seasonal storage of solar energy plus a much smaller secondary water tank for storage of solar energy collected during the heating season. The system offers the advantage of high collection efficiency during the early stages of the heating season, a period when the temperature of the primary tank is generally high. The resulting improvement in annual system efficiency through the addition of a small secondary tank is found to be substantial - for the site considered (Madison, Wisconsin), the relative percentage gain in annual performance is in the range of 10 to 20%. A simple computer model permits accurate hour-by-hour transient simulation of thermal performance over a yearly cycle. Results are presented of detailed simulations of collector and storage sizing and design tradeoffs for solar energy systems supplying 90 to 100% of annual heating load requirements. DOE

N80-25868# Aerojet Energy Conservation Co., Sacramento, Calif.
MULTI-USE GEOTHERMAL ENERGY SYSTEM WITH AUGMENTATION FOR ENHANCED UTILIZATION. A NON-ELECTRIC APPLICATION OF GEOTHERMAL ENERGY IN SUSANVILLE, CALIFORNIA Quarterly Technical Report, 1 Apr. - 30 Jun. 1978
G. R. Cunnington and G. K. Olson 1978 56 p refs
(Contract ET-78-C-03-1740)
(SAN-1740-2) Avail: NTIS HC A04/MF A01

The economic and technical feasibility of using the low to moderate temperature geothermal resource in the Susanville anomaly in a district heating/cooling system for public or private users and in a Park of Commerce developed in conjunction with the resources development is analyzed. Design approaches were studied which permit economical utilization of the resource regardless of the outcome of the drilling. The system selected depends on the result of the drilling program. A data base is presented on systems for the temperature range from 150 to 239 F. Based on a predicted fuel inflation rate of 7% and a municipal bond interest rate of 10%, the development of the Susanville Geo-Heating District is economically feasible over the entire range of anticipated reservoir conditions. Under conditions of high well costs ($130 to $175 thousands dollars per well) and low resources temperature (150 to 165 F), economic and operational advantages can be shown for the use of heat pumps to augment the resource temperature. DOE

N80-25869# Georgia Univ., Athens. Dept. of Chemistry.
DEVELOPMENT OF A PRACTICAL PHOTOCHEMICAL ENERGY STORAGE SYSTEM. THE NORBORNADIENE-QUADRICYCLENE ENERGY STORAGE SYSTEM Final Report

Richard R. Hautala, Charles R. Kutal, and R. Bruce King 15 Aug. 1979 41 p refs
(Contracts EY-76-S-09-0893; DE-AS09-76EV-00893)
(SRO-0893-17) Avail: NTIS HC A03/MF A01

The photosensitized conversion of norbornadiene to quadricyclene has been examined as a promising method for storing energy from sunlight. A device based on this reaction requires two steps: (1) energy storage through the sensitized photolysis of norbornadiene to quadricyclene in an endothermic reaction; and (2) energy release through the catalyzed reconversion of quadricyclene to norbornadiene in an exothermic reaction. Both sensitizers and catalysts have been sucessfully incorporated onto heterogeneous supports, and in several instances these immobilized components perform as well as or better than their homogeneous counterparts. An overview of the scientific progress achieved in each of the areas noted is reported. In addition, the energy capacity of the norbornadiene-quadricyclene system (relative to some typical applications) is assessed and the potential costs associated with this type of photochemical energy storage are analyzed. DOE

N80-25870# General Electric Co., Philadelphia, Pa. Valley Forge Space Center.
REQUIREMENT DEFINITION AND PRELIMINARY DESIGN OF A PHOTOVOLTAIC CENTRAL POWER STATION EXPERIMENTAL TEST FACILITY Final Report
G. OBrien, R. Pohl, and N. Turner Dec. 1979 481 p refs
(Contract EY-76-C-04-0789)
(SAND-79-7022-Vol-1) Avail: NTIS HC A21/MF A01

The requirements and preliminary design for a photovoltaic central power station experimental test facility are described. Requirements, a preliminary design, costs and schedule were established for the facility construction. Utility participation was reviewed with selected utilities, and both a site selection methodology and a summary set of combined continental US insolation and meteorological data was prepared. The major results, the detailed technical discussion, cost and plans, for the experimental test facility as well as sets of preliminary specifications, drawings, and site selection data are given. DOE

N80-25871# Battelle Columbus Labs., Ohio.
THE DEVELOPMENT OF ELECTROCHEMICAL PHOTOVOLTAIC CELLS Technical Progress Report, 1 Aug. - 31 Oct. 1979
A. E. Austin, H. J. Byker, and E. W. Brooman 21 Nov. 1979 13 p Prepared for Midwest Research Inst., Golden, Colo.
(Contract EG-77-C-01-4042)
(DSE-4042-T11; TPR-2) Avail: NTIS HC A02/MF A01

The development of stable, efficient, photoelectrochemical cells based on silicon and gallium arsenide in nonaqueous electrolyte systems was investigated. Redox reactions of ferrocene, anthracene and anthraquinone were studied on platinum and n-silicon electrodes. The latter were further characterized by differential capacitance measurements. Cells and equipment were designed and set up for long term stability studies. DOE

N80-25872# Argonne National Lab., Ill.
EVALUATION OF RELIABILITY OF OPERATIONAL SOLAR-ENERGY SYSTEMS
J. A. Mavec, E. Waite, and R. Wolosewicz 1979 8 p refs Presented at Ann. Solar Heating and Cooling Systems Operational Results, Colorado Springs, Colo., 27 Nov. 1979
(Contract W-31-109-eng-38)
(CONF-791105-2) Avail: NTIS HC A02/MF A01

A reliability study of two solar heating systems using air as the heat transfer medium is presented. Failure modes and effects analysis were used to examine the controls of the systems for three operating modes. Principal components were identified for each mode, and a fault tree and reliability block diagram was constructed to structure the fault or failed sequence. Established failure rates were assigned to each component, and an exponential failure distribution was assumed. For components operating on demand at a given average frequency, the adjusted demand and normal operating failure rates were combined to reflect the total contribution. Representative operational times and component frequencies were found for each operating mode. A fault tree computer code was used to determine minimal outsets to the top event, remove redundant events, and perform necessary calculations. DOE

N80-25873# Alabama Univ. in Huntsville. Environmental Energy Center.
DATA HANDBOOK FOR THE NATIONAL SOLAR ENERGY DEMONSTRATION BOOK
David L. Christensen May 1979 87 p
(Contract EM-78-S-01-5216)
(DSE-5216-T4) Avail: NTIS HC A05/MF A01

Information is provided in a matrix format listing technical and programmatic data concerning the various project sites selected for the National Solar Energy Demonstration Program. The commercial, residential, and other demonstration projects which are now a part of the national program, are incorporated into one handbook, as a reference source for technical and research purposes on a state-by-state basis. DOE

N80-25874# Department of Energy, Washington, D. C. Office of Energy Research.
PRELIMINARY ENVIRONMENTAL ASSESSMENT FOR THE SATELLITE POWER SYSTEM (SPS), REVISION 1. VOLUME 1: EXECUTIVE SUMMARY
Jan. 1980 64 p refs
(DOE/ER-0036/1) Avail: NTIS HC A04/MF A01

A preliminary assessment of the environmental impacts of the proposed satellite power system (SPS) is summarized. In this system, satellites would collect solar energy in space, convert it to microwaves, and transmit the microwaves to receiving antennas (rectennas) on Earth. At the rectennas, the microwaves would be converted to electricity. The assessment considers microwave and nonmicrowave effects on the terrestrial environment and human health, atmospheric effects, and disruption of communications and other electromagnetic systems. DOE

N80-25875# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
CONCEPTUAL DESIGN OF ADVANCED CENTRAL RECEIVER POWER SYSTEMS SODIUM-COOLED RECEIVER CONCEPT. VOLUME 1: EXECUTIVE SUMMARY Final Report
Jun. 1979 64 p
(Contract EG-77-C-03-1483)
(SAN-1483-1/1; ESG-79-2-Vol-1) Avail: NTIS HC A04/MF A01

The conceptual design of an advanced receiver power system using liquid sodium as a heat transport medium was completed. The technical and economic advantages of this concept were determined for commercial-scale power plants. Topics covered included: (1) review and analysis of preliminary specification; (2) parametric analysis; (3) select commercial configuration; (4) commercial plant conceptual design; (5) assessment of commercial plant; (6) advanced central receiver power system development plan; (7) program plan; (8) reports and data; (9) program management; and (10) safety analysis. A programmatic overview of the accomplishments of this program is given. The 100 MW conceptual commercial plant, the 281 MW optimum plant, and the 10 MW pilot plant are described. DOE

N80-25876# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
CONCEPTUAL DESIGN OF ADVANCED CENTRAL RECEIVER POWER SYSTEMS SODIUM-COOLED RECEIVER CONCEPT. VOLUME 2, BOOK 1: COMMERCIAL PLANT CONCEPTUAL DESIGN Final Report
Mar. 1979 400 p refs
(Contract EG-77-C-03-1483)
(SAN-1483-1/2; ESG-79-2-Vol-2-BK-1) Avail: NTIS HC A17/MF A01

The conceptual design of the 100 MW solar tower focus commercial power plants is described in detail. Sodium is pumped up to the top of the tall tower where the receiver is located. The sodium is heated in the receiver and then flows down the tower, through a pressure reducing device, and into a large, hot storage tank made to meet a specific thermal energy storage capacity requirement. The sodium is pumped by a separate pump, through a system of sodium to water steam generators. The sodium flowing from the evaporator unit is piped to a cold

storage tank. From the cold storage tank, sodium is then pumped up to the tip of the tower to complete the cycle. The steam generated in the steam generators is fed to a conventional off-the-shelf, high-efficiency turbine. The steam loop operates in a conventional rankine cycle with the steam generators serving the same purpose as a conventional boiler and water being fed to the evaporator with conventional feedwater pumps. DOE

N80-25877# Oak Ridge National Lab., Tenn. Computer Sciences Div.
COMPARATIVE METHOD FOR THE EVALUATION OF ARRAY REFLECTOR MATERIALS
J. T. Thomas Oct. 1979 25 p refs
(Contract W-7405-eng-26)
(ORNL/CSD-42) Avail: NTIS HC A02/MF A01

A general method for the evaluation of materials as reflectors surrounding array of subcritical units of fissile materials is presented. Applied to the materials used in a safe and secure trailer, it is concluded that the carrier effectiveness of a reflector can be expected to be less than that of a 2.5 cm thick water reflector. DOE

N80-25878# Battelle Pacific Northwest Labs., Richland, Wash.
SITING SMALL WIND TURBINES
W. T. Pennell and H. L. Wegley Mar. 1979 16 p refs Presented at the Workshop on Wind Energy Appl. in Agr., Ames, Iowa, 15-16 May 1979
(Contract EY-76-C-06-1830)
(PNL-SA-7603) Avail: NTIS HC A02/MF A01

A procedure is presented for choosing the best available site for a wind turbine. A method for estimating the pertinent wind characteristics once the site is chosen is also described. In some cases, extensive onsite measurements may be required before an accurate analysis of turbine performance can be made. DOE

N80-25879# Sandia Labs., Albuquerque, N. Mex.
PRELIMINARY DEVELOPMENT OF THE BAND TYPE VARIABLE INERTIA FLYWHEEL (BVIF) Final Report
D. G. Ullman Nov. 1979 163 p refs
(Contract EY-76-C-04-0789)
(SAND-79-7089) Avail: NTIS HC A08/MF A01

An energy storage flywheel with variable moment of inertia, combining the functions of energy storage and power control is introduced and discussed. The specific configuration addressed is the band type variable flywheel (BVIF). This hollow shell flywheel is packed with long thin bands of flexible material mounted like the main spring in a watch. The performance equations of this configuration are derived and studied. A proof-of-concept model is described and conclusions are drawn on the BVIF'S operational potential. DOE

N80-25880# California Univ., Livermore. Lawrence Livermore Lab.
SITE AND BUILDING ENERGY-CONSERVATION STUDY: SURVEY OF BUILDING 251, DIAGNOSTIC CHEMISTRY
Oct. 1979 68 p
(Contract W-7405-eng-48)
(UCRL-15190) Avail: NTIS HC A04/MF A01

An energy-conservation study of Building 251, Diagnostic Chemistry, at Lawrence Livermore Laboratory was performed. The survey of Building 251 was based on a review of the design drawings, an on-site inspection of the 30,500 sq ft building, and discussions with the building manager and various operating personnel. Data were collected regarding the number of people occupying the building, operating schedules, and the energy loads imposed by installed and temporary equipment. The heating, ventilating, and air conditioning systems were investigated. The building energy systems were simulated using the DOE-1 energy program. A base year energy consumption run was made, together with simulation of the building's performance assuming installation of each of nine energy conservation opportunities (ECO's) identified. A summary of the energy savings that would result from implementation of the ECO's is presented. DOE

N80-25881# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
INTERNATIONAL ANALYSIS OF RESIDENTIAL ENERGY USE AND CONSERVATION
Lee Schipper Oct. 1979 28 p refs Presented at Intern. Conf. on Energy Use Management, Los Angeles, 22 Oct. 1979
(Contract W-7405-eng-48)
(LBL-9383; CONF-791009-27) Avail: NTIS HC A03/MF A01

Data were collected and are being analyzed on residential energy use from Canada, Japan, UK, West Germany, France, Italy, and Sweden. Preliminary inspection indicates that much of the variation of energy use depends on structural of lifestyle factors such as incomes, house or appliance size, hot water, and indoor temperature habits. There appears to exist a wide range of energy intensities within each narrow end use category, each of these ranges suggest that there are interesting prospects for energy conservation in any one country based on technologies or ideas common elsewhere. DOE

N80-25882# Lockheed Missiles and Space Co., Palo Alto, Calif.
AMORPHOUS THIN FILMS FOR SOLAR CELL APPLICATION Quarterly Report, 31 Mar. - 30 Jun. 1979
A. D. Jonath, H. F. MacMillan, J. L. Crowley, W. W. Anderson, F. A. Junga, C. F. Kooi, T. K. McNab, W. R. Scoble, and J. A. Thornton Jul. 1979 33 p
(Contract DE-AC03-79ET-23040)
(DOE/ET-23040/1; LMSC-D678155; QR-1) Avail: NTIS HC A03/MF A01

The prospects for generation of significant electric power using low cost photovoltaic solar cells seem brighter with recent developments in sensitive impurity doping of glow-discharge-produced films of amorphous silicon containing large amounts of hydrogen (a-Si:H). The approach being taken to achieve the program objective centers on substituting sputtering for glow-discharge in the deposition of the a-Si:H films. Both planar and cylindrical forms of magnetron sputtering are being investigated in this program. Brief descriptions of the systems being used are presented. The planar system has the advantage that experimental costs are low; the cylindrical system is easily scalable to large product throughout. A-Si:H films are being prepared by magnetron sputtering, with reactive gases and/or doped Si targets, to achieve a reproducible and controllable process for the fabrication of solar cell devices. Ion implantation is being used for alloying and doping studies. DOE

N80-25883# Department of Energy, Washington, D. C. Office of Solar Applications.
SOLAR ENERGY PROJECT: AN OVERVIEW
Jan. 1980 44 p refs
(DOE/CS-0124) Avail: NTIS HC A03/MF A01

The secondary school project is described which was developed by divisions of the University of the State of New York including the State Education Department, the University at Albany's Atmospheric Sciences Research Center and secondary schools represented by 80 participating science teachers. This cooperative effort of scientist and educator resulted in 43 classroom-tested activities suitable for infusion into five science curriculum areas, including junior high science, earth science, biology, chemistry and physics. These activities are also appropriate for the development of a separate solar energy course of study. National dissemination and pilot testing of this project will begin during the fall of 1978. DOE

N80-25884# Department of Energy, Washington, D. C.
PHOTOVOLTAIC ENERGY SYSTEMS: PROGRAM SUMMARY
Jan. 1980 466 p refs
(DOE/CS-0146) Avail: NTIS HC A20/MF A01

The DOE Photovoltaic Energy Systems Program is designed to expand as rapidly as possible the commercial use of photovoltaic systems through a program of research, process development in support of the manufacturing industry, tests and applications, and general support of market development. The objective of the Photovoltaic Energy Systems Program is to reduce system costs to a competitive level in both distributed and centralized grid-connected applications. The program is also examining the technical, institutional, legal, environmental and social issues involved in fostering widespread adoption of photovoltaic energy systems. Activities of the program are divided into the following subprograms: advanced research and development; technology

development; systems engineering and standards; test and applications; commercialization; and planning, assessment, and integration. Summary sheets for each of the contractors in this program are presented. The summaries include project title, contractor, contract number, funding, principal investigator, and a brief description of the contract. DOE

N80-25885# Delaware Univ., Newark. College of Engineering.
THEORY OF THIN-FILM PHOTOVOLTAICS Quarterly Report, 16 Apr. - 30 Jun. 1979
Karl W. Boer 30 Jun. 1979 10 p refs
(Contract DE-AC01-79ET-23103)
(DOE/ET-23103/4; QR-1) Avail: NTIS HC A02/MF A01

The carrier transport through heterojunctions is influenced by the interconnection between the bands of the two semiconductors, by space charge effects near this interconnection and by interface recombination. The estimation of the discontinuity of the conduction bands using the difference in electron affinities is insufficient. A modified model takes the chemical and crystallographical nature of the interconnection into consideration. The analysis includes the discussion of a space charge double layer caused by charged dangling bonds along the dislocation network and its compensation via charged defects. These cause a certain donor-acceptor pair formation which act as efficient recombination centers and cause a reduction of the open circuit voltage. The space charge double layer and interface recombination may cause a non-monotonic band profile near the interface. The specifics of such band profile of CdS/Cu2S and Cd/sub x/Zn/sub 1-x/S/Cu2S heterojunctions are evaluated quantitatively and agree within the experimental error with the observation, that, with decreasing lattice mismatch, the open circuit voltage increases, while the short circuit current decreases. DOE

N80-25886# Boston Univ., Mass. Dept. of Chemistry.
PHOTOCHEMICAL DETERMINANTS OF THE EFFICIENCY OF PHOTOGALVANIC CONVERSION OF SOLAR ENERGY
Morton Z. Hoffman and Norman N. Lichtin 1979 35 p refs
(Contract EY-76-S-02-2889)
(COO-2889-5) Avail: NTIS HC A03/MF A01

A photogalvanic cell is a battery in which the cell solution absorbs light directly to generate species which, upon back reaction through an external circuit with the aid of suitable electrodes, produces electric power; photoactivation of the electrodes is not involved. The charge-carrying species have storage capacity if they are long-lived and can be prevented from engaging in degradative back reactions in bulk solution. The efficiency of a photogalvanic cell for the conversion of photon energy into electrical energy is determined by photochemical and electrochemical factors. Among the latter are the choice of electrode materials and the kinetics of electron transfer at the heterogeneous surfaces. The photochemical determinants of the efficiency of photogalvanic cell operations are examined: the absorption spectral characteristics of the cell solution, the efficiency of formation of separated charge carriers, and the lifetimes of the carriers toward back electron transfer. Modulation of bulk solution dynamics can be achieved by variation of the solution medium. The photochemical determinants are discussed with particular reference to the use of thionine or RU(bpy)2/3(+) as the light absorbing species. DOE

N80-25887# Texas Technological Univ., Lubbock.
VORTEX MODEL OF THE DARRIEUS TURBINE: AN ANALYTICAL AND EXPERIMENTAL STUDY
J. H. Strickland, B. T. Webster, and T. Nguyen Feb. 1980 156 p refs
(Contract EY-76-C-04-0789)
(SAND-79-7058) Avail: NTIS HC A08/MF A01

A preliminary aerodynamic performance prediction model has been constructed for the Darrieus turbine using a vortex lattice method of analysis. A series of experiments were conducted for the express purpose of validating the analytical model. These experiments were conducted on a series of two dimensional rotor configurations which were towed in a large tank of water. The use of water as a working fluid was intended to facilitate both flow visualization and the ability to measure aerodynamic blade forces while allowing operation at sufficiently high Reynolds numbers. The primary purpose of this research was to allow reasonable predictions of aerodynamic blade forces and moments to be made. DOE

N80-25888# Rockwell International Corp., Golden, Colo. Rocky Flats Plant.
NEW DEVELOPMENTS IN WIND SYSTEMS TECHNOLOGY
R. L. Moment 1979 22 p refs Presented at 2d Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla. 10 Dec. 1979
(Contract EY-76-C-04-3533)
(RFP-3000; CONF-791204-20) Avail: NTIS HC A02/MF A01

Development programs for U.S. wind turbines of under 100 kW output are reviewed. The system configurations and approaches to component design are discussed. DOE

N80-25889# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
TECHNICAL AND MANAGEMENT SUPPORT FOR THE DEVELOPMENT OF SMALL WIND SYSTEMS Annual Report, 1 Oct. 1977 - 30 Sep. 1978
Feb. 1979 147 p refs
(Contract EY-76-C-04-3533)
(RFP-2974/3533-79-2) Avail: NTIS HC A07/MF A01

The FY 1978 annual report of the Rocky Flats Wind Systems Program describes the objectives, approach, and achievements of the program and each of its tasks areas during the period 1 October 1977 - 30 September 1978. During this period, additional testing of ten small wind energy conversion systems (SWECS) was conducted and the Test Center was expanded to accommodate up to 30 SWECS. Work on nine design and analysis projects for advanced prototypes in three size ranges progressed through a series of design reviews, with prototype delivery scheduled to begin in mid-1979. Supporting activities included a Systems Engineering project which analyzed the cost of SWECS components and fabrication, a task effort in technical support to standards development, and the dissemination of information. DOE

N80-25890# Institute of Gas Technology, Chicago, Ill.
HEAT-PUMP-CENTERED INTEGRATED COMMUNITY ENERGY SYSTEMS: SYSTEMS DEVELOPMENT, CONSOLIDATED NATURAL GAS SERVICE COMPANY Final Report
Nathaniel R. Baker, Timothy D. Donakowski, R. Bruce Foster, Darrell L. Sala, Raymond R. Tison, Thomas P. Whaley, Bernard D. Yudow, and Paul F. Swenson (Consolidated Nat. Gas Serv. Co., Cleveland) Jan. 1980 342 p refs Prepared for Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(ANL/CNSV/TM-29) Avail: NTIS HC A15/MF A01

The heat actuated heat pump centered integrated community energy system (HAHP-ICES) is described. The system utilizes a gas fired, engine-driven, heat pump and commercial buildings, and offers several advantages over the more conventional equipment it is intended to supplant. The general nonsite specific application assumes a hypothetical community of one 59,000 cu ft office building and five 24 unit, low rise apartment buildings located in a region with a climate similar to Chicago. Various sensitivity analyses are performed and through which the performance characteristics of the HAHP are explored. The results provided the selection criteria for the site specific application of the HAHP-ICES concept to a real world community. The site-specific community consists of: 42 town houses; five 120 unit, low rise apartment buildings; five 104 unit high rise apartment buildings; one 124,000 cu ft office building; and a single 135,000 cu ft retail building. DOE

N80-25891# EIC, Inc., Newton, Mass.
NEW ELECTROLYTES FOR DIRECT METHANE FUEL CELLS Final Report, 10 Jan. 1977 - 9 Jan. 1979
S. B. Brummer, J. Foos, J. McHardy, J. McVeigh, D. Toland, and M. Turner May 1979 74 p refs
(Contracts EY-76-C-03-1363; DE-AC03-79ET-11321)
(DOE/ET-11321/T1) Avail: NTIS HC A04/MF A01

A fuel cell electrolyte for the direct oxidation of CH4 and/or impure H2 fuels was developed. Emphasis is placed on di and tribasic methanesulfonic acids CX2(SO3H)2 and CX(SO3H3) here

X is H, F, or Cl. Synthetic routes to CH2(SO3H)2, CH(SO3H)3, CO2(SO3H)2, and CO(SO3H)3 were identified and optimized. The diphenyl ester of CF2(SO3H)2 was prepared for the first time and various approaches to CF(SO3H)3 was investigated. In parallel with the synthetic program, apparatus was designed and fabricated for the testing of the electrolytes under fuel cell conditions. Electrodes with low Pt loading were developed for use in electrolyte evaluation. Optimum performance with H3PO4 was achieved using 1 mg Pt/cu cm and 1 mg TFE 30 cu cm deposited on TFE tape, supported on a Au plated Ta screen, and sintered. Preliminary half cell tests using CH2(SO3H)2 and CH(SO3H)3 indicated that these acids are insufficiently stable for use as fuel cell electrolytes. DOE

N80-25892# California Univ., Berkeley. Energy and Resources Group.

RISK OF RENEWABLE ENERGY SOURCES: A CRITIQUE OF THE INHABER REPORT

John P. Holdren, Kent Anderson, Peter H. Gleick, Irvin Mintzer, Gregory Morris, and Mirk R. Smith (East-West Center Honolulu, Hawaii) Jun. 1979 142 p refs

(Contract W-7405-eng-48)

(ERG-79-3) Avail: NTIS HC A07/MF A01

The Inhaber report, Risk of Energy Production (Atomic Energy Control Board Report AECB-1119, Ottawa, Canada, 1978;EAPA 5:15) is refuted. Error and the consequences of correcting are described. Also discussed are the circumstances - including the roles of the author, the sponsors, and the knowledgeable tehnical community - that permitted to report to gain widespread credibility DOE

N80-25893# California Univ., Livermore. Lawrence Livermore Lab.

EVALUATION OF AIR CATHODES FOR POTENTIAL USE IN DEVELOPMENT OF ALUMINUM-AIR CELLS

J. W. Pyper, B. E. Kelly, and J. F. Cooper Dec. 1979 38 p refs

(Contract W-7405-eng-48)

(UCID-18561) Avail: NTIS HC A03/MF A01

Four air cathodes representing the products of three manufacturers were tested under conditions of continuous and intermittent polarization in order to determine their suitability for testing large scale aluminum-air single cells. The W electrode performed for 312 h with a decrease of potential of 0.11 V at 1.3 kA/sq m. The X standard electrode failed to sustain continuous polarization for longer than 12 h. Both W and Z electrodes met or nearly met polarization requirements. The tests demonstrated that the W electrode is sufficiently durable and low in polarization to be used for testing 0.1 sq m aluminum-air cells. DOE

N80-25894# Argonne National Lab., Ill.

RELIABILITY, ENERGY AND COST EFFECTS OF WIND INTEGRATION WITH CONVENTIONAL ELECTRICAL GENERATING SYSTEMS

W. A. Buehring, K. A. Hub, C. C. Huber, J. C. Vankuiken, and J. G. Gros (DOE, Washington, D.C.) 1979 14 p refs Presented at the 2nd Miami Intern. Conf. on Alternative Energy Sources., Miami Beach, Fla., 10-13 Dec. 1979

(Contract W-31-109-eng-38)

(CONF-791204-32) Avail: NTIS HC A02/MF A01

The importance of system integration analysis in evaluating the effects of wind powered generation on an electrical utility system was studied. For the assumed utility and wind conditions it was shown that an intermittent energy source such as wind can contribute to overall system reliability. Since reliability indices are the primary criteria for utility expansion planning, it should be possible to reduce conventional capacity installations in response to the reliability improvements associated with wind generation. With both energy and reliability benefits it appears that there is a reasonable potential for wind generators to be competitive, in limited penetrations, with conventional capacity. DOE

N80-25895# Argonne National Lab., Ill. Chemical Engineering Div.

ADVANCED FUEL CELL DEVELOPMENT Progress Report, Jan. - Mar. 1979

R. D. Pierce, P. A. Finn, K. Kinoshita, G. H. Kucera, R. B. Poeppel, J. W. Sim, and R. N. Singh Sep. 1979 47 p refs

(Contract W-31-109-eng-38)

(ANL-79-51) Avail: NTIS HC A03/MF A01

Advanced fuel cell research activities are discussed. The effort directed toward understanding and improving the components of molten-carbonate-electrolyte fuel cells operated at temperatures near 925 K. The primary focus of this work was the development of electrolyte structures that have good electrolyte retention and mechanical properties as well as long term stability, and on developing methods of synthesis amendable to mass production. Current electrolyte structures are comprised of LiAlO2 particles and an eutectic of Li2CO3 and K2CO3. DOE

N80-25896# Brookhaven National Lab., Upton, N. Y.

OPTIMIZATION OF SOLAR ASSISTED HEAT PUMP SYSTEMS VIA A SIMPLE ANALYTIC APPROACH

John W. Andrews 1980 6 p refs Presented at the 2d Ann. Systems Simulation and Econ. Anal. Conf., San Diego, Calif., 23-25 Jan. 1980

(Contract EY-76-C-02-0016)

(BNL-27316; CONF-800101-17) Avail: NTIS HC A02/MF A01

An analytic method for calculating the optimum operating temperature of the collector/storage subsystem in a solar assisted heat pump is presented. A tradeoff exists between rising heat pump coefficient of performance and falling collector efficiency as this temperature is increased, resulting in an optimum temperature whose value increases with increasing efficiency of the auxiliary energy source. Electric resistance is shown to be a poor backup to such systems. A number of options for thermally coupling the system to the ground are analyzed and compared. DOE

N80-25897# Sandia Labs., Albuquerque, N. Mex.

AERODYNAMIC INTERFERENCE BETWEEN TWO DARRIEUS WIND TURBINES

P. R. Schatzle, P. C. Klimas, and H. R. Spahr 1980 6 p refs Presented at the Wind Energy Conf., Boulder, Colo., 9 Apr. 1980

(Contract EY-76-C-04-0789)

(SAND-79-1984C; CONF-800406-2) Avail: NTIS HC A02/MF A01

The effect of aerodynamic interference on the performance of two curved bladed Darrieus-type vertical axis wind turbines was calculated using a vortex/lifting line aerodynamic model. The turbines have a power-to-power separation distance of 1.5 turbine diameters, with the line of turbine centers varying with respect to the ambient wind direction. The effects of freestream turbulence were neglected. For the cases examined, the calculations showed that the downwind turbine power decrement (1) was significant only when the line of turbine centers was coincident with the ambient wind direction, (2) increased with increasing tip-speed-ratio, and (3) is due more to induced flow angularities downstream than to speed deficits near the downstream turbine. DOE

N80-25898# Ames Lab., Iowa.

OXYGEN REDUCTION ON A GRAPHITE PASTE AND A CATALYST LOADED GRAPHITE PASTE ELECTRODE

Ph.D. Thesis

Dennis Michael DiMarco Mar. 1980 166 p refs

(Contract W-7405-eng-82)

(IS-T-886) Avail: NTIS HC A08/MF A01

Oxygen reduction was studied in basic solution at a graphite paste electrode. The graphite paste electrode was used as the disk of a rotating ring disk electrode and experiments were done using the voltage scan technique. The enhancements afforded by catalysts applied to the graphite paste electrode were also studied. Oxygen reduction on a Graphite Paste Electrode was a two electron process resulting in the formation of peroxide. The Tafel slope (plotted as potential versus log [i/sub 1/ai/i/sub1/-i]) was 180 millivolts. The presence of gold, silver, or platinum on the graphite paste electrode shifted the oxygen reduction gave approximately 800 millivolts in the anodic direction. The metal catalyzed graphite paste electrode produced a greater fraction of peroxide as a product than did the solid metal electrode. Silver and gold catalyzed graphite paste electrode gave Tafel slopes of about 120 millivolts. The intermediate catalysis of iron

and cobalt porphyrin was also examined. The cobalt prophyrin catalyzed oxygen reduction at a more anodic potential than the iron porphyrin and the latter appeared more active in reacting the peroxide formed as the product of the disk reaction. DOE

N80-25899# Aluminum Co. of America, Alcoa Center, Pa.
DESIGN AND FABRICATION OF A LOW-COST DARRIEUS VERTICAL AXIS WIND TURBINE SYSTEM, PHASE 1
Mar. 1980 295 p refs
(Contract EM-78-C-04-4272)
(ALO-4272) Avail: NTIS HC A13/MF A01

The design phase of a low cost Darrieus-type vertical axis wind turbine for commercialization in the United States is presented. The system definition, cost estimates, system performance analysis, structural design analysis, and environmental considerations are described. R.E.S.

N80-25900# Midwest Research Inst., Golden, Colo.
ANALYSIS OF COMMUNITY SOLAR SYSTEMS FOR COMBINED SPACE AND DOMESTIC HOT WATER HEATING USING ANNUAL CYCLE THERMAL ENERGY STORAGE
F. C. Hooper, J. D. McClenahan, J. D. Cook, F. Baylin, R. Monte, and S. Silliman Jan. 1980 9 p refs Presented at the 2nd Ann. Systems Simulation and Econ. Anal. Conf., San Diego, Calif., 23-25 Jan. 1980 Prepared in cooperation with Toronto Univ., Ontario
(Contract EG-77-C-01-4042)
(SERI/TP-355-570; CONF-800101-20) Avail: NTIS HC A02/MF A01

A simplified design procedure was examined for estimating the storage capacity and collector area for annual-cycle-storage, community solar heating systems in which 100% of the annual space heating energy demand is provided from the solar source for the typical meteorological year. Hourly computer simulations of the performance of these systems were carried out for 10 cities in the United States for 3 different building types and 4 community sizes. These permitted the use of design values for evaluation of a more simplified system sizing method. Results of this study show a strong correlation between annual collector efficiency and two major, location-specific, annual weather parameters: the mean air temperature during daylight hours and the total global insolation on the collector surface. Storage capacity correlates well with the net winter load, which is a measure of the seasonal variation in the total load, a correlation which appears to be independent of collector type. DOE

N80-25901# Department of Energy, Washington, D. C. Office of Buildings and Community Systems.
PROPOSED ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS: STANDARD BUILDING OPERATING CONDITIONS
Nov. 1979 79 p
(DOE/CS-0118) Avail: NTIS HC A05/MF A01

The process of developing energy budget levels for new commercial buildings, in conjunction with the energy-performance standards for new buildings, includes the use of energy-analysis computer programs. These programs are used to estimate the design energy requirements of randomly selected commercial buildings. The input to these programs includes a set of data known as the Standard Building Operating Conditions (SBOC). These SBOC consist of temperatures, human-occupancy densities and profiles, lightning-usage profiles, and the like. They describe typical conditions under which a commercial or multifamily residential building would operate during the course of a day. The standardization of the building operating conditions is described. Alternative ways that SBOC may be applied in a regulatory compliance context are discussed as well as the advantages and disadvantages of each alternative. The implications of the standardization of operating conditions are examined.DOE

N80-25902# Department of Energy, Washington, D. C. Office of Buildings and Community Systems.
PROPOSED ENERGY-PERFORMANCE STANDARDS FOR NEW BUILDINGS: PASSIVE AND ACTIVE SOLAR-HEATING ANALYSIS
Nov. 1979 70 p
(DOE/CS-0117) Avail: NTIS HC A04/MF A01

The use of passive and active solar thermal heating technologies was analyzed in order to develop standards for new buildings. Maximum permissible levels of annual building design energy consumption were established for different building types in various climates. Besides reducing the use of depletable energy, the standards are intended to achieve maximum practicable increases in the use of nondepletable sources of energy. Cost and energy savings estimates were developed for optimally-sized passive solar systems corresponding to the prototype house characteristics represented by each point on the conservation cost/performance curves (from previous studies). An analysis was performed for each of the ten (Atlanta, Burbank, Chicago, Fresno, Ft. Worth, Houston, Minneapolis, Phoenix, Portland, and Washington) representative cities in the conservation study analysis. The key elements of the methodology were: thermal performance estimation, optimum system size determination, and sensitivity analysis. DOE

N80-25903# SRI International Corp., Menlo Park, Calif.
LINE-FOCUS SOLAR CENTRAL POWER SYSTEMS, PHASE 1 Topical Report, 29 Sep. 1978 - 30 Apr. 1979
A. J. Slemmons May 1979 115 p refs
(Contract EY-76-C-03-0015)
(SAN-0115-140-1) Avail: NTIS HC A06/MF A01

The subsystem and system parametric analysis for a 100 MW/sub e/ solar central power plant of the high temperature, line focus, cavity receiver type were completed. Annual levelized busbar energy costs of 55 mills/kWh are projected for the 80th plant. The conceptual design of the plant was initiated. DOE

N80-25904# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
SOLAR ENERGY PROGRAM. CHAPTER FROM THE ENERGY AND ENVIRONMENT DIVISION REPORT Annual Report
Aug. 1979 42 p refs
(Contract W-7405-eng-48)
(LBL-9630) Avail: NTIS HC A03/MF A01

Important aspects of assessing solar applications are discussed. The amount and character of circumsolar radiation is examined with respect to geographic location, climate, season, time of day, and observed wavelength. The major optical, physical, and chemical considerations involved in designing, building, and operating a solar receiver are evaluated. The application of passive solar design concepts to the nonresidential building sector are explored. R.C.T.

N80-25905# California Univ., Livermore. Lawrence Livermore Lab.
SOLAR-ASSISTED HEAT PUMP-SWIMMING POOL SYNERGISTICS FOR DOMESTIC HEATING
T. R. Galloway Oct. 1979 11 p refs Presented at Systems Simulation and Econ. Analysis Conf., San Diego, Calif., 23 Jan. 1980
(Contract W-7405-eng-48)
(UCRL-83458; CONF-800101-1) Avail: NTIS HC A02/MF A01

A 150 cu m home, clear performance and economic advantages are shown for a solar assisted heat pump, providing domestic hot water and space heating and cooling. The pump uses a year round solar heated swimming pool as a large thermal energy reservoir. The pool cycles seasonably between 18 and 31 C, allowing year round swimming, and provides an excellent water source for the heat pump and low cost, low temperature plastic solar panels operating at their near optimum efficiency. The system was optimized by examining the performance and cost characteristics of different glazed and unglazed solar panel collector (areas from 28 to 150 cu m and orientation from horizontal to 60 deg tilt) for sites in San Francisco Bay Area and in San Joaquin Valley. DOE

N80-25906# Southern California Gas Co., Los Angeles.
SAGE, SOLAR ASSISTED GAS ENERGY Summary Report
S. J. Cunningham and J. Rice Sep. 1979 34 p
(Grant NSF PTP-75-03457)
(PB80-144363; NSF/RA-790330) Avail: NTIS HC A03/MF A01 CSCL 13A

A multidisciplinary effort to examine the problems of introducing solar energy into the United States building industry was conducted. The following were emphasized: (1) field installations and tests to evaluate new vs. retrofit installations; (2) market assessment of the potential for a SAGE water heating system in apartment buildings; and (3) policy analysis of strategies that would contribute to widespread utilization of SAGE water heating. Technical results of field installations and tests are described for two installations using the system configuration chosen from pilot plant analysis. GRA

N80-25907# Southern California Gas Co., Los Angeles.
SAGE, SOLAR ASSISTED GAS ENERGY Final Report
S. J. Cunningham Sep. 1979 225 p refs
(Grant NSF PTP-75-03457)
(PB80-153836; NSF/RA-790331) Avail: NTIS HC A10/MF A01 CSCL 13A

A technical and economic baseline for assessing the practical potential of solar water heating for apartments was developed. Several steps were involved in the development: (1) installing and testing two solar assisted gas energy (SAGE) water heating systems; (2) assessing the market potential for a SAGE water heating system and possible business arrangements; and (3) analyzing strategies that would contribute to wide-spread utilization of SAGE water heating. Project findings are reported with respect to technical results, cost analysis, system performance and maintenance results, market assessment and policy analysis. GRA

N80-25908# NEUS, Inc., Santa Monica, Calif.
BIOSOURCES DIGEST, A JOURNAL ON BIOMASS UTILIZATION, VOLUME 1, NO. 1
Harry Sobel, ed. Jan. 1979 90 p refs
(Grant NSF PFR-77-12500)
(PB80-140973; NSF/RA/790068) Avail: NTIS HC A05/MF A01 CSCL 10A

Biomass utilization, enzyme technology as it relates to it, renewable resources, industrial chemicals, fuels and energy from biomass biological nitrogen fixation, and biophotolysis are considered with energy derived from biomass. Benefits derived from stored solar energy collected from forests are discussed along with a theory and methodology for quantifying them. Alternatives to the presently-utilized processes for large-scale regeneration of ATP and ADP as required by biosynthetic processes are given. Production and collection of biomass and conversion of biomass are discussed. GRA

N80-25909# NEUS, Inc., Santa Monica, Calif.
BIOSOURCES DIGEST: A JOURNAL ON BIOMASS UTILIZATION, VOLUME 1, NO. 4
Harry Sobel, ed. Oct. 1979 61 p refs
(Grant NSF PFR-77-12500)
(PB80-140981; NSF/RA-790297) Avail: NTIS HC A04/MF A01 CSCL 10A

Information on various aspects of biomass utilization is presented. Recent biomass related grants are abstracted and listed giving the title, sponsor, organization, grant number and project investigator. Articles are presented on thermochemical conversion of biomass to gasoline, predicting solar energy fluxes in polluted urban areas, principles, equipment and operation of two lab-scale biodigesters, energy farming in New Zealand, and a general procedure for converting latex-bearing crops to glucose, lignin and rubber. Also included are miscellaneous documents received and a report on forestation as a renewable energy source and one on the photoproduction of hydrogen. GRA

N80-25910# General Accounting Office, Washington, D. C. Energy and Minerals Div.
MAGNETOHYDRODYNAMICS: A PROMISING TECHNOLOGY FOR EFFICIENTLY GENERATING ELECTRICITY FROM COAL. REPORT TO THE CONGRESS
11 Feb. 1980 61 p refs
(PB80-143175; EMD-80-14) Avail: NTIS HC A04/MF A01 CSCL 10B

The status potential, and alternative Federal strategies for development of electricity from coal are discussed. It is recommended that the Secretary of Energy: (1) evaluate the status of testing at current facilities and its effect on maintaining the pilot plant design schedule; (2) analyze the advantages and disadvantages of alternative types of pilot plants; and (3) establish a mechanism for actively involving potential users in the program. GRA

N80-25911# National Bureau of Standards, Washington, D.C. National Engineering Lab.
ENERGY TEST METHOD DEVELOPMENT FOR ELECTRIC HEAT PUMP WATER HEATERS Final Report, Mar. 1978 - May 1979
C. Andrew Wan Jan. 1980 87 p refs
(Contract EW-78-I-05-5750)
(PB80-145212; NBSIR-79-1951) Avail: NTIS HC A05/MF A01 CSCL 13A

Modifications are proposed for the current U.S. Department of Energy test procedures for water heaters in order to make them applicable to electric heat pump water heaters. The modifications are in the areas of definitions and technical procedures. The latter includes the test conditions, test procedures and measurements, and calculations. Reasons for making these modifications and laboratory test data are provided to support the modifications in the technical procedures. GRA

N80-25912# Research Triangle Inst., Research Triangle Park, N. C.
NOVEL CONCENTRATOR PHOTOVOLTAIC CONVERTER SYSTEM DEVELOPMENT Final Report, 24 Jan. - 30 Aug. 1979
S. M. Bedair, J. R. Hauser, M. F. Lamorte, S. Photak, and M. L. Timmons Mar. 1980 62 p refs Prepared jointly with North Carolina Univ., Raleigh and North Carolina State Univ., Raleigh
(Contract EY-76-C-04-0789)
(SAND-80-7004) Avail: NTIS HC A04/MF A01

Several material systems were investigated for their potential use in a cascade solar cell. The studies included basic materials properties as well as p-n junction studies for the top cell, tunnel junction, and bottom cell. While junctions appropriate to each individual part of the cascade cell were demonstrated, problems still remain in fabricating a high efficiency cascade solar cell because of material and growth problems with the semiconductor layers which have optimum bandgaps. DOE

N80-26257# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Turbomachines Div.
AN OPEN CYCLE TURBINE SOLAR THERMAL POWER SYSTEM
Emile LeGrives *In its* La Rech. Aerospatiale, BiMonthly Bull. no. 1979-6 (ESA-TT-632) 1979 p 11-38 refs Transl. into ENGLISH Of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1979-6, Nov. - Dec. 1979 p 355-373 Original report in FRENCH previously announced as A80-19989 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-25913 Louisiana State Univ. and A&M Coll., Baton Rouge.
MEASUREMENT AND CORRELATION OF MOLECULAR METAL POLLUTANTS IN THE AIR TO EXISTING WEATHER CONDITIONS. DEVELOPMENT OF CARBON ATOMIZERS FOR ATOMIC ABSORPTION WITH HIGH SENSITIVITY AND METAL SPECIATION CAPABILITY Ph.D. Thesis
Larry Jerome Rhodes 1979 295 p
Avail: Univ. Microfilms Order No. 8013142

A combinational thermal vaporizer/atomizer employing an atomic absorption detector was designed and built. This prototype instrument successfully demonstrated the concept of metal speciation by atomic absorption. Volatile organometallics and metal complexes were easily discernible from the much volatile inorganic metal species. The concentrations of ambient heavy metal pollutants were then related to existing weather conditions. Dissert. Abstr.

N80-25914# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
METEROLOGICAL EFFECTS ON AIR POLLUTION IN SAO PAULO
Alberto Setzer, Iracema F. A. Cavalcanti, and Bendita C. Martelino Jan. 1980 39 p refs In PORTUGUESE
(INPE-1669-RPE/107) Avail: NTIS HC A03/MF A01

The relation among the meteorological parameters and indexes of pollution was analyzed to determine the critical conditions for producing high indexes. The period of verification was analyzed to show the influence of the existing system at the station. Results indicate that the synoptic situation is of fundamental importance in providing the local effects, which favor the concentration or dispersal of pollutants. It is recommended that this analysis be used in forecasting air pollution.

Transl. by F.O.S.

N80-25915# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 122: F-16 AIRCRAFT, NEAR AND FAR FIELD NOISE
Robert G. Powell Aug. 1979 115 p refs
(AF Proj. 7231)
(AD-A081844; AMRL-TR-75-50-Vol-122) Avail: NTIS HC A06/MF A01 CSCL 01/2

This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for four power conditions. Near-field data are reported for eight locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. Refer to volume 1 of this handbook, 'USAF Bioenvironmental Noise Data Handbook, vol 1: Organization, Content and Application', AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations. GRA

N80-25916# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 144: F-106A IN-FLIGHT CREW NOISE
Harald K. Hille Jul. 1979 15 p refs
(AF Proj. 7231)
(AD-A081846; AMRL-TR-75-50-Vol-144) Avail: NTIS HC A02/MF A01 CSCL 01/2

The F-106A is a USAF all-weather fighter. This report provides measured data defining the bioacoustic environments at the pilot's location inside this aircraft for 19 flight conditions. Data are reported for one location in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to volume 1 of this handbook, 'USAF Bioenvironmental Noise Data Handbook, volume 1: Organization Content and Application,' AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. GRA

N80-25917# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 145: F-106B IN-FLIGHT CREW NOISE
Harald K. Hille Jul. 1979 16 p refs
(AF Proj. 7231)
(AD-A081847; AMRL-TR-75-50-Vol-145) Avail: NTIS HC A02/MF A01 CSCL 01/2

This volume provides measured data defining the bioacoustic environments produced inside the aircraft. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the F-106B aircraft. This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type, noise data in the handbook describe the noise produced during ground operations of aircraft, ground support equipment, and other ground-based equipment or facilities. Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Refer to volume 1 (reference 1) for such information because it is not repeated in other handbook volumes. A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., in-flight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, Ohio 45433. GRA

N80-25918# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 146: F-16B IN-FLIGHT CREW NOISE
Harald K. Hille Aug. 1979 21 p refs
(AF Proj. 7231)
(AD-A081848; AMRL-TR-75-50-Vol-146) Avail: NTIS HC A02/MF A01 CSCL 01/2

The F-16B is a two-seated light-weight fighter. This report provides measured data defining the bioacoustic environments at the pilot's location inside this aircraft for 31 flight conditions. Data are reported for two locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to volume 1 of this handbook, 'USAF Bioenvironmental Noise Data Handbook, volume 1: Organization, Content and Application,' AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedres, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. GRA

N80-25919# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
NATIONAL EMISSIONS DATA SYSTEM (NEDS). FUEL USE REPORT
Aug. 1979 127 p
(PB80-146905; EPA-450/4-79-020) Avail: NTIS HC A07/MF A01 CSCL 21D

Annual estimates of total consumption of major fuels such as coal, fuel, oil, natural gas, gasoline, and diesel fuel are summarized. Estimates of the consumption of a number of other comparatively minor fuels are also included. The data are distributed according to major categories of air pollutant emissions as a whole and for individual states, territories, and the District of Columbia. GRA

N80-25920# Aerodyne Research, Inc., Bedford, Mass.
HOMOGENEOUS PRODUCTION AND REMOVAL OF NOx FROM COMBUSTION EXHAUST GASES Quarterly Technical Summary Report, 1 Dec. 1979 - 29 Feb. 1980
J. A. Silver, C. M. Gozewski, and C. E. Kolb Mar. 1980 24 p refs
(Contract ET-78-C-01-3183)
(ARI-RP-52; QTSR-6) Avail: NTIS HC A02/MF A01

The final reaction rate constants for $NH_2 + NO$ were determined. A measurement of the fraction of product channels

which form OH provides an approximate value of 0.2, but the uncertainties in the method used make this value a lower limit. The reaction of OH + NH3 yields NH2 + H2O showed a simple Arrhenius dependence with temperatures to 1200 K. A chemical model of the NOx chemistry was developed. Runs using this set reproduced the gross temperature dependence of the thermal deNOx process. DOE

N80-25921# California Univ., Berkeley. Lawrence Berkeley Lab. Marine Sciences Group.
OCEAN THERMAL ENERGY CONVERSION ECOLOGICAL DATA REPORT FROM OSS RESEARCHER IN GULF OF MEXICO, 12-23 JULY 1977
M. S. Quinby-Hunt, comp. Jun. 1979 60 p refs
(Contract W-7405-eng-48)
(LBL-8945; GOTEC-01) Avail: NTIS HC A04/MF A01

Ecological measurements important for environmental assessment of the effect of an operating Ocean Thermal Energy Conversion plant were initiated in July 1977 at the proposed Gulf of Mexico site off the coasts of Louisiana, Mississippi, Alabama and Florida. The initial cruise of the OSS Researcher, in a joint effort with the Atlantic Oceanic and Meteorological Laboratories (AOML) of the National Oceanic and Atmospheric Administration (NOAA), and Lawrence Berkeley Laboratory (LBL) took place from 12 to 23 July 1977. The measurements were taken at 15 oceanographic stations to a maximum depth of 1000 m. Water was analyzed for trace metals, nutrients and chlorophyll a and ATP. Physical data, salinity and dissolved oxygen measurements were supplied by NOAA-AOML. Two bioassays were carried out using indigenous phytoplankton to estimate the effect of deep water on the rates of 14CO2 uptake of photic zone algae. The Deep Scattering Layer (DSL) was monitored at the site by a continuously recording 12 kHz depth sounder at the Mobile site. Data collected during the cruise is presented. DOE

N80-25922# Los Alamos Scientific Lab., N. Mex.
EFFECTS OF ROCKET EXHAUST PRODUCTS IN THE THERMOSPHERE AND IONOSPHERE
John Zinn and C. Dexter Sutherland Feb. 1980 23 p refs
(Contract W-7405-eng-36)
(LA-8233-MS) Avail: NTIS HC A02/MF A01

The current state of understanding of the problem of ionospheric F layer depletions produced by chemical effects of the exhaust gases from large rockets is reviewed with particular emphasis on the heavy lift launch vehicles (HLLV) proposed for use in the construction of solar power satellites. The currently planned HLLV flight profile calls for main second stage propulsion confined to altitudes below 124 km, and a brief orbit circularization maneuver at apogee. The second stage engines deposit H2O and H2 molecules between 74 and 124 km. Model computations show that they diffuse gradually into the ionospheric F region, where they lead to weak but widespread and persistent depletions of ionization and continuous production of H atoms. The orbit circularization burn deposits 9 x 10 exhaust molecules at about 480 km altitude. These react rapidly with the F 2 region O(+) ions, leading to a substantial (factor-of-three) reduction in plasma density, which extends over a 1000 by 2000 km region and persists for four to five hours. DOE

N80-25923# Argonne National Lab., Ill.
CONSEQUENCES OF INCREASED COAL UTILIZATION
Arnold J. Goldbert, L. J. Hoover, and Terrance Surles 1979 42 p ref Presented at 72nd Ann. Am. Inst. of Chem. Engr. Meeting, San Francisco, 25-29 Nov. 1979 Prepared jointly with Brookhaven Nat. Lab.; Los Alamos Sci. Lab., California Univ. Lawrence Berkley Lab., Oak Ridge Nat. Lab., and Pacific Northwest Labs.
(Contract W-31-109-eng-38)
(CONF-791108-16) Avail: NTIS HC A03/MF A01

The consequences of increasing coal use to meet the proposed goals of the National Energy Plan (1977) were regionally analyzed. Ten technical areas were considered: siting, air quality, long-range transport of sulfur dioxide, water quality, availability, solid wastes, socioeconomics, national economics, and occupational safety and health effects. The results of the analyses are summarized. DOE

N80-25924# Stanford Univ., Calif. Dept. of Statistics.
PROBABILITY MODELING AND ESTIMATION FOR HOURLY VARIATION OF AIR POLLUTION CONCENTRATIONS. STUDY ON STATISTICS AND ENVIRONMENTAL FACTORS IN HEALTH (SIMS) Ph.D. Thesis
Chen-Hui Foo Dec. 1979 57 p refs Sponsored in part by Rockefeller Foundation, Sloan Foundation, EPA and NSF
(Contract EY-76-S-02-2874)
(DOE/EY-22874/66; TR-31) Avail: NTIS HC A04/MF A01

Model building in air pollution research is considered, particularly the time when the concentration is high. The probability model presented is intended to describe the behavior of high pollutant concentrations. Data are from San Jose air monitoring. DOE

N80-25925# Aerodyne Research, Inc., Bedford, Mass.
HOMOGENEOUS PRODUCTION AND REMOVAL OF NOx FROM COMBUSTION EXHAUST GASES Quarterly Technical Summary Report, 1 Sep. - 30 Nov. 1979
J. A. Silver, C. M. Gozewski, and C. E. Kilb Dec. 1979 18 p refs
(Contracts ER-78-C-01-3183; T-78-C-01-3815)
(ARI-RP-49; QTSR-5) Avail: NTIS HC A02/MF A01

The rate constant for the reaction of NH2 + NO was measured over the temperature range of 294 to 1200 K. It exhibits a decrease in value with increasing temperatures. An upper limit to the rate of reaction of NH3 + NO yields NH2 + HNO is also reported. The hydroxyl radical was identified as one of the products of the NH2 + NO reaction, and the implications of this upon the modeling is discussed. DOE

N80-25926# Department of Energy, Washington, D. C. Div. of Environmental Control Technology.
DIVISION OF ENVIRONMENTAL CONTROL TECHNOLOGY PROGRAM, 1978 Annual Report
Jun. 1979 259 p refs
(DOE/EV-0042; AR-2) Avail: NTIS HC A12/MF A01

The independent overview and assessment of environmental control aspects of both the U.S. Department of Energy's research, development, and demonstration programs and the Nation's energy policies and the reduction of potential environmental hazards at the radioactively contaminated sites that are presently owned or were formerly used by the Government are reviewed. A short summary is presented of objectives, approach, progress and results, future plans, and a reference bibliography for each research, development, or assessment project within the program areas described. DOE

N80-25927# Argonne National Lab., Idaho Falls, Idaho.
ENVIRONMENTAL ASSESSMENTS OF ALTERNATIVE ENERGY STRATEGIES IN THE UNITED STATES
Stephen W. Ballou and Arthur Katz (DOE, Washington, D.C.) 1979 18 p refs Presented at the Intern. Inst. for Appl. Systems Analysis, Vienna, 5-9 Nov. 1979
(Contract W-31-109-eng-38)
(CONF-791172-1) Avail: NTIS HC A02/MF A01

The evaluation of the regional impacts of future energy development is discussed. The impacts described for 1990 are based on a national energy projection (scenario) that assumes medium energy demand and fuel supply through 1990, but does not incorporate the policies of the 1978 National Energy Act. County level patterns for utility, industry and mining activities for 1990 are developed from the federal region totals. Energy sources addressed are coal, nuclear, oil, oil shale, gas, geothermal, hydroelectric, and solar. The impact of these county-level patterns of utility, industry, and mining activities on the air, water, and land resources of the country and on the socioeconomic and health and safety aspects of the nation's welfare are analyzed. DOE

N80-25928# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ENVIRONMENTAL ASSESSMENT OF SMALL WIND SYSTEMS Progress Report
Kathryn Lawrence, Carol Strojan, and Daniel ODonnell Feb. 1980 37 p refs
(Contract EG-77-C-01-4042)
(SERI/PR-354-420) Avail: NTIS HC A03/MF A01

The first formal product of the environmental assessment of small wind energy conversion systems (SWECS) study is presented. An overview of the study's structure, planned activities, and a synopsis of task progress is given. DOE

N80-25929# Department of Energy, Washington, D. C. Assistant Secretary for Resource Applications.
ENVIRONMENTAL ASSESSMENT: GEOTHERMAL ENERGY GEOPRESSURE SUBPROGRAM. DOE SWEET LAKE NO. 1, CAMERON PARISH, LOUISIANA
Feb. 1980 245 p refs
(DOE/EA-0065) Avail: NTIS HC A11/MF A01

Geothermal geopressure resource feasibilities in the Louisiana-Texas Gulf Coast region were examined. An environmental assessment was prepared to evaluate environmental effects of test site construction of geothermal fluid wells for intermittent production testing. Physical and chemical composition of the fluids, their temperature, the nature of flow, fluid disposal techniques, and the reliability and performance of equipment were studied. Biological surveys were prepared of ecosystem cultural alterations due to the construction of the geothermal geopressure test facilities. R.G.D.

N80-25930# Automotive Testing Labs., Inc., Aurora, Colo.
A STUDY OF EMISSIONS FROM PASSENGER CARS IN SIX CITIES, VOLUME A Final Report
Jan. 1979 868 p 2 Vol.
(Contract EPA-68-03-2593)
(PB80-149800; EPA-460/3-78-011A) Avail: NTIS HC A99/MF A01 CSCL 13B

This is the first of two volumes presenting results from a series of exhaust emission and fuel economy tests performed on a representative sample of vehicles in six U.S. cities. Data presented in the following sections are generated in appendix form as part of a contract with the EPA to perform work for the FY 77 Passenger Car Emission Factor Program. Volume A includes a technical discussion of test and data handling procedures, laboratory facility descriptions, and test instrument maintenance and calibration practices. Pertinent data concerning vehicle sample composition and results of Federal Test Procedure, Highway Fuel Economy and Federal Short Cycle Tests are also presented. GRA

N80-25931# Automotive Testing Labs., Inc., Aurora, Colo.
A STUDY OF EMISSIONS FROM PASSENGER CARS IN SIX CITIES, VOLUME B Final Report
Jan. 1979 872 p 2 Vol.
(Contract EPA-68-03-2593)
(PB80-149816; EPA-460/3-78-011B) Avail: NTIS HC A99/MF A01 CSCL 13B

This is the second of two volumes presenting results from a series of exhaust emission and fuel economy tests performed on a representative sample of vehicles in six U.S. cities. Data presented in the following sections are generated in appendix form as part of a contract with the EPA to perform work for the FY 77 Passenger Car Emission Factor Program. Volume B includes the balance of individual vehicle data derived from the Two Speed Idle and Federal Three Mode tests. It also includes the results of Vehicle Driveability Evaluations, Maladjustment and Disablement Inspections, tire inspections and a listing of comparative mileage data. Information presented in volume B should not be interpreted without the benefit of additional descriptive data presented in volume A as both volumes comprise the results of a single work effort and are not intended to be considered separately. GRA

N80-25932# Virginia Highway and Transportation Research Council, Charlottesville.
AN EMPIRICAL RELATIONSHIP BETWEEN MESOSCALE CARBON MONOXIDE CONCENTRATIONS AND VEHICULAR EMISSION RATES Final Report
Gerardo G. Clemena Jul. 1979 53 p refs Sponsored by Federal Highway Admin., Virginia Dept. of Highways and Transportation, and Virginia Univ.
(PB80-138308; VHTRC-80-R2; FHWA/VA-80/2) Avail: NTIS HC A04/MF A01 CSCL 04A

Presented is a relatively simple empirical equation that resonably approximates the relationship between mesoscale carbon monoxide (CO) concentrations, areal vehicular CO emission rates, and the meteorological factors of wind speed and mixing height. The approximation is an extension of rollbeck modeling and was derived from aerometric data measured at a major urban area in Virginia. A similar equation has been found valid for data measured at another major urban area. Author

N80-25933# SRI International Corp., Menlo Park, Calif.
ASSESSMENT OF VERTICAL DISTRIBUTIONS OF PHOTOCHEMICAL POLLUTANTS AND METEOROLOGICAL VARIABLES IN THE VICINITY OF URBAN AREAS Final Report
F. L. Ludwig Aug. 1979 185 p refs
(Contract EPA-68-02-2662)
(PB80-139918; EPA-450/4-79-017) Avail: NTIS HC A09/MF A01 CSCL 04A

A system for classifying vertical profiles of ozone and other photochemical pollutants was derived by analyzing 268 ozone profiles obtained from published reports and EPA data files. The profiles fall into six different categories that are related to the relative importance of the following factors; destruction of ozone near the surface, vertical mixing, and photochemical production. One hundred and eight representative examples of the vertical profiles are presented and discussed, most with corresponding temperature data and many with aerosol (nephelometer), NOx, or hydrocarbon data. The locations relative to an urban area and the times when each profile type is most apt to occur are discussed in terms of the statistics of the data set and the physical processes involved. GRA

N80-25934# SRI International Corp., Menlo Park, Calif.
ATMOSPHERIC DISTRIBUTIONS, SOURCES AND SINKS OF SELECTED HALOCARBONS, HYDROCARBONS, SF6, AND N2O Final Report
H. B. Singh, L. J. Salas, H. Shigeishi, A. J. Smith, E. Scribner, and L. A. Cavanagh Nov. 1979 149 p refs
(Grant EPA-8038020)
(PB80-142706; EPA-600/3-79-107) Avail: NTIS HC A07/MF A01 CSCL 04A

Global distributions of a large number of halocarbons, hydrocarbons, SF6, and N2O are presented. These data are complemented with measurements in the polluted environments to establish urban-nonurban relationships of these species. Atmospheric growth rates of selected species are characterized based on measurements conducted between 1975 and 1978. GRA

N80-25935# Meteorology Research, Inc., Altadena, Calif.
POLLUTANT MEASUREMENTS IN PLUMES FROM POWER PLANTS AND CITIES - ST. LOUIS AREA, JULY 1976. A PROJECT MISTT (MIDWEST SULFUR TRANSFORMATION AND TRANSPORT) REPORT Final Report, Jun. 1976 - Dec. 1977
John A. Ogren, Jerry A. Anderson, and Donald L. Blumenthal Nov. 1979 59 p refs
(Contract EPA-68-02-2411)
(PB80-139058; MRI-78-FR-1586; EPA-600/7-79-242) Avail: NTIS HC A04/MF A01 CSCL 13B

Airborne measurements of aerosols and pollutant gases in urban and power plant plumes were conducted during July 1976 in the vicinity of St. Louis, Missouri. The measurements were designed to characterize the physical and chemical behavior of these plumes under a variety of meteorological conditions. The airborne data were analyzed to gain a better understanding of the factors affecting the transport, transformation, and removal of primary and secondary pollutants, particularly those containing sulfur. The field program and experimental techniques are described, and the results and conclusions of the analyses of the airborne measurements and meteorological data are presented. GRA

N80-25936# Battelle Columbus Labs., Ohio.
METHODS FOR ANALYZING INORGANIC COMPOUNDS IN PARTICLES EMITTED FROM STATIONARY SOURCES Interim Report, Jan. 1977 - Jul. 1978
William M. Henry Sep. 1979 130 p refs
(Contract EPA-68-02-2296)
(PB80-141781) Avail: NTIS HC A07/MF A01 CSCL 14B

Methods to identify and measure inorganic compounds in particulate emissions which emanate from sources using or processing fossil fuels were developed. Large masses, 20 to 100 grams of field samples were collected representative of a range of both coal and oil-fired fly ashes, and the selected methodology development efforts were evaluated on these field samples as well as synthesized samples. Fourier transform infrared spectroscopy, X-ray diffraction, and chemical phase separations and analyses are the methods which have provided the most definitive identification of inorganic compounds. The structural findings by these methods are complemented by complete cation-anion chemical determinations. GRA

N80-25937# Battelle Columbus Labs., Ohio.
EVALUATION OF STATIONARY SOURCE PARTICULATE MEASUREMENT METHODS. VOLUME 4: BASIC OXYGEN FURNACES Interim Report, Oct. 1973 - Jun. 1977
J. E. Howes, Jr., W. M. Henry, and R. N. Pesut Aug. 1979 68 p refs
(Contract EPA-68-02-0609)
(PB80-141633; EPA-600/2-79-141-Vol-4) Avail: NTIS HC A04/MF A01 CSCL 14B

A procedure, EPA method 5, for sampling and determining particulate concentrations in emissions from stationary sources was specifically evaluated at basic oxygen furnaces (BOF) equipped with wet-scrubbers of electrostatic precipitators (ESP) controls. Although wet-scrubber emissions could potentially present the most difficulty since the sampling system must handle a moisture-laden gas stream with entrained water droplets, no problems were found when using method 5. Variation of the sampling rate at 0.7 and 1.3 times isokinetic also did not significantly affect the accuracy of the mass measurements. Chemical analyses confirmed that the method 5 procedure extracts a representative sample of the BOF/ESP stack particulate emissions. GRA

N80-25938# Martin Marietta Corp., Baltimore, Md. Environmental Center.
MODELING OF BUOYANT PLUME DISPERSION IN COMPLEX TERRAIN Final Report
Jeffrey C. Weil Aug. 1979 102 p refs
(PB80-145337; PPSP/PPRP-35) Avail: NTIS HC A06/MF A01 CSCL 13B

A mathematical model for a bouyant plume in neutral and stably-stratified flows over a two dimensional hill was developed. Wind tunnel experiments under idealized conditions were used to test the model. Field measurements were then compared with wind tunnel simulations of stack plume dispersion from a 'real' source in complex terrain. The mathematical model consisted of equations describing the ambient wind field and equations describing the plume superimposed on the wind. The equations were solved numerically to obtain the plume characteristics. A 1:2000 scale wind tunnel model of the stacks and terrain at the Westvaco pulp mill (Luke, Md.) was built to simulate the transport and dispersion of stack SO2 plumes about a large nearby hill. GRA

N80-25939# California Univ., Riverside. Statewide Air Pollution Research Center.
MECHANISMS OF PHOTOCHEMICAL REACTIONS IN URBAN AIR Final Report, 1 Dec. 1974 - 30 Nov. 1978
James Pitts, Karen Darnall, William P. L. Carter, Arthur M. Winer, and Roger Atkinson Nov. 1979 583 p refs
(Grant EPA-R-800649)
(PB80-132384; EPA-600/3-79-110) Avail: NTIS HC A25/MF A01 CSCL 07D

Data required for the validation of models for chemical transformation in air pollution are presented. A 5800 liter, Teflon coated, evacuable, thermostatted chamber and a 25 kW xenon arc solar simulator were used for irradiations, under simulated atmospheric conditions, of various hydrocarbon NOx-air mixtures. Results from a total of 114 irradiation, employing representative alkanes, olefins, aromatics, and oxygenates, both singly and in two or multi-hydrocarbon mixtures, are reported. The kinetic and mechanism of the gas phase reaction of hydroxyl radicals with o-cresol and methoxy benzene were studied. The reactions of O3 with acetylene, methiglyoxal and a series of aromatic hydrocarbons were also studied. GRA

N80-25940# Bureau of Mines, Salt Lake City, Utah. Research Center.
FLUE GAS DESULFURIZATION BY THE MODIFIED CITRATE PROCESS: REPORT OF INVESTIGATIONS
R. H. Lien, D. A. Martin, and W. I. Nissen 1979 24 p refs
(PB80-134836; BM-RI-8403) Avail: NTIS HC A02/MF A01 CSCL 13B

A flue gas desulfurization process was developed. The process known as the citrate process, involves absorption of sulfur dioxide (SO2) in a buffered solution of citric acid. As an adjunct to the citrate process, bench scale research shows that SO2-loaded citrate or glycolate solutions can be regenerated by countercurrent contact with steam (stripping) in packed towers. Stripping steam requirements were determined for treatment of 0.25, .50, 1.0, and 2.0% SO2 waste gases. Steam requirements decreased with increasing SO2 concentrations in the simulated waste gases. GRA

N80-25941# Environmental Monitoring and Support Lab., Research Triangle Park, N. C. Quality Assurance Branch.
TRANSFER STANDARDS FOR THE CALIBRATION OF AMBIENT AIR MONITORING ANALYZERS FOR OZONE: TECHNICAL ASSISTANCE DOCUMENT Final Report
Frank F. McElroy Sep. 1979 156 p refs
(PB80-146871; EPA-600/4-79-056) Avail: NTIS HC A08/MF A01 CSCL 07D

Ozone transfer standards and their purpose and role in calibrating ambient ozone analyzers are described. Various advantages and disadvantages of their use are discussed. Several different types of ozone transfer standards are described, including analytical instruments, manual analytical procedures and ozone generation devices. The procedures necessary to establish the authority of ozone transfer standards are detailed. GRA

N80-25942# Delaware Univ., Newark. Dept. of Civil Engineering.
CONTRIBUTIONS OF URBAN LAND USE TO STREAM WATER QUALITY M.S. Thesis
Daniel Lain Davis Jun. 1979 147 p refs
(Contract DI-14-34-0001-8070)
(PB80-151178; W80-03644; OWRT-B-018-DEL(2)) Avail: NTIS HC A07/MF A01 CSCL 08H

The impact of urban runoff on stream water quality with respect to cadmium and lead in both the particulate and liquid phase, was examined for the Christiana River in the Newark, Delaware area. Five stations were selected, each depicting a different degree of urbanization. Measured concentrations were correlated with stream volumetric flow rates so that storm discharge values could be calculated. Four complete storm events were sampled at appropriate time intervals with results indicating that lead pollution originated from surface stormwater runoff. GRA

N80-25943# Gulf South Research Inst., New Orleans, La.
RESEARCH TO IDENTIFY COMPONENTS OF ENERGY-RELATED WASTES: A STATE-OF-THE-ART REPORT Final Report, Nov. 1976 - Nov. 1978
J. E. Gebhart and Mary M. McKown Dec. 1979 526 p
(Contract EPA-68-03-2487)
(PB80-137961; EPA-600/7-79-255) Avail: NTIS HC A23/MF A01 CSCL 13B

Pertinent abstracts from a survey of current (post 1976) research projects were categorized according to energy-related activity. Subjects include coal strip mines, oil refineries, oil shale operations, coal-fired power plants, geothermal energy production, coal liquefaction plants, and potential quality control standards. Abstracts of available technical reports are also presented using the same energy categories. These reports were obtained from a variety of sources, including MEDLINE, TOXLINE, BIOSIS, CAIN, NTIS, DIALOG, and Chemical Abstracts. Federal energy research centers supplied a large number of pertinent documents. This state-of-the-art summary is provided as an aid to researchers concerned with the environmental effects of energy-related activites. GRA

N80-25944# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
DETERMINATION OF THE EFFECTS OF AMBIENT CONDI-

TIONS OF CFM56 AIRCRAFT ENGINE EMISSIONS Final Report
T. F. Lyon, W. J. Dodds, and D. W. Bahr Dec. 1979 125 p refs
(Contract EPA-68-03-2388)
(PB80-138597; R79AEG632; EPA-460/3-79-011) Avail: NTIS HC A06/MF A01 CSCL 13B

The effects of ambient temperature, humidity, and pressure on the emissions of hydrocarbons, carbon monoxide, oxides of nitrogen, and smoke from a CFM56 engine combustor were determined through rig tests in which combustor inlet conditions could be carefully controlled. In addition, the data were verified in full-scale engine tests under uncontrolled ambient conditions. For each test condition, emissions measurements were made twice. A total of 214 separate test points were run. The combustor test conditions, along with the measured emissions levels, were transmitted in computer-readable format for subsequent analysis of the data. R.E.S.

N80-25945# Environmental Sciences Research Lab., Research Triangle Park, N.C. Atmospheric Chemistry and Physics Div.
BIOGENIC HYDROCARBON CONTRIBUTION TO THE AMBIENT AIR OF SELECTED AREAS - TULSA; GREAT SMOKEY MOUNTAINS; RIO BLANCO COUNTY, COLORADO
Robert R. Arnts and Sarah A. Meeks Jan. 1980 43 p refs
(PB80-139066; EPA-600/3-80-023) Avail: NTIS HC A03/MF A01 CSCL 13B

In response to the suggestion that biogenic emissions are responsible for the high hydrocarbon concentrations described in several reports, a short term sampling was initiated as a means of validation. A limited number of whole-air samples were collected in Tedlar bags and analyzed by gas chromatography with flame ionization detection. The areas of study included: Tulsa, Oklahoma; Rio Blanco County, Colorado; and the Great Smokey Mountains in Tennessee. Although the tests were of short duration, the results suggest monoterpenes and isoprene constitutes minor components of rural air relative to anthropogenic hydrocarbons. GRA

N80-25946# Union Carbide Corp., Bound Brook, N.J. Chemical and Plastics Research Labs.
SOLID SORBENT FOR COLLECTING ATMOSPHERIC SULFUR DIOXIDE Final Report, May 1975 - Nov. 1977
R. J. Cotter and S. G. Smith Dec. 1979 44 p refs
(Contract EPA-68-02-1782)
(PB80-131949; EPA-600/2-79-205) Avail: NTIS HC A03/MF A01 CSCL 13B

A solid sorbent for collecting atmospheric SO2 was evaluated as part of an effort to develop a replacement method for the West-Gaeke method presently used to measure 24 hour ambient sulfur dioxide concentrations in ambient air. Research showed that a solid sorbent, consisting of Puramer S coated open cell polyurethane foam, can be used to fix the quantities of sulfur dioxide that would be collected if typical ambient air was filtered for 24 hours at 200 cc/min. Troublesome sulfur dioxide decay occuring during post collection storage was primarily the result of oxidation. Decay was minimized to an acceptable level by sealing the spent Puramer S collector devices to prevent oxygen thermal desorption and subsequent assaying. GRA

N80-25947# TRW Defense and Space Systems Group, Redondo Beach, Calif.
THE USE OF pH AND CHLORIDE ELECTRODES FOR THE AUTOMATIC CONTROL OF FLUE GAS DESULFURIZATION SYSTEMS Final Report, Sep. 1978 - Jul. 1979
Clinton Ung, Toby Accian, and Ray Maddalone Nov. 1979 80 p ref
(Contract EPA-68-02-2165)
(PB80-138464; EPA-600/2-79-202) Avail: NTIS HC A05/MF A01 CSCL 13B

The applicability of chloride and pH electordes in automated control systems was investigated via a survey of chloride and pH electrodes in different flue gas desulfurization (FGD) systems and an evaluation of an industrial pH electrodes system. The survey showed that chloride ion measurements were necessary only where high chloride values correspond with FGD unit corrosion and when chloride values were used at correction factors in ph calculations. Chloride ion measurements are unnecessary for most of the surveyed companies. All survey companies use pH measurement to control scaling or to attain optimum performance in FGD units. The most common pH electrode problem was residue buildup (scaling) around the electrode, caused by the use of non-self-cleaning (standard) pH electrodes. The performance of self-cleaning and standard industrial pH electrodes was evaluated. GRA

N80-25948# PEDCo-Environmental, Inc., Cincinnati, Ohio.
GUIDANCE FOR LOWEST ACHIEVABLE EMISSION RATES FROM 18 MAJOR STATIONARY SOURCES OF PARTICULATE, NITROGEN OXIDES, SULFUR DIOXIDE, OR VOLATILE ORGANIC COMPOUNDS
Apr. 1979 358 p refs Sponsored by EPA
(PB80-140262; EPA-450/3-79-024) Avail: NTIS HC A16/MF A01 CSCL 13B

Ways for achieving lowest achievable emission rates (LAER) for 18 major stationary sources of particulate, nitrogen oxides, or volatile organic compounds are described. The source categories addressed are stationary gas turbines, kraft pulp mills, steel and iron foundries, petroleum refineries (three sources), fabric coating, industrial boilers, primary aluminum plants, bulk gasoline terminals, flat wood coating, gasoline and crude oil storage graphic arts, and the coating of automobiles and light trucks, metal furniture and large appliances, cans, metal coils, and paper. GRA

N80-25949# Wisconsin Univ. - Madison. Dept. of Soil Science.
A RAPID ANALYSIS OF SURFACE WATERS BY HIGH PRESSURE LIQUID CHROMATOGRAPHY M.S. Thesis
Kent Huibregtse 1979 160 p refs
(Contract DI-14-34-0001-6052)
(PB80-132681; W80-02603; OWRT-A-069-WIS(1)) Avail: NTIS HC A08/MF A01 CSCL 07D

A simple rapid method for obtaining fingerprint traces of nonpolar organic contaminants on water samples by trace enrichment and high pressure liquid chromatography was developed. Chromatograms of samples taken above, at, or below the outfalls of industrial plants sewage treatment facilities, and other point sources of pollution clearly revealed differences in water fingerprints which indicated the extent and persistance downstream of organic containments. GRA

N80-25950# Systems Applications, Inc., San Rafael, Calif.
PERFORMANCE MEASURES AND STANDARDS FOR AIR QUALITY SIMULATION MODELS Final Report
S. R. Hayes Oct. 1979 317 p refs
(Contract EPA-68-02-2593)
(PB80-152838; EPA-450/4-79-032) Avail: NTIS HC A14/MF A01 CSCL 04B

A concept for objectively evaluating model performance was developed. Five attributes of a well-behaving model are defined: accuracy of the peak prediction, absence of systematic bias, lack of gross error, temporal correlation, and spatial alignment. The relative importance of these attributes is shown to depend on the issue being addressed and the pollutant being considered. Acceptability of model behavior was determined by calculating several performance measures and comparing their values with specfic standards. GRA

N80-25951# Environmental Monitoring and Support Lab., Research Triangle Park, N. C. Statistical and Technical Analysis Branch.
AIR QUALITY DATA FOR METALS, 1976, FROM THE NATIONAL AIR SURVEILLANCE NETWORKS Final Report
Raymond C. Rhodes, Donald H. Fair, J. E. Frazer, S. J. Long, W. A. Loseke, V. A. Wheeler, and J. F. Walling Aug. 1979 272 p refs
(PB80-147432; EPA-600/4-79-054) Avail: NTIS HC A12/MF A01 CSCL 04B

The urban and nonurban concentrations of 11 metallic ions in suspended particulate matter are listed. The data are presented as a composite concentration value for each site for each of the four quarters of the calendar year; a yearly average is reported whenever valid data for all four quarters are obtained. Overall national summaries are compared for the years 1970 through 1976. GRA

N80-25952# Environmental Protection Agency, Washington, D.C. Div. of Stationary Source Enforcement.
COMPLIANCE STATUS OF MAJOR AIR POLLUTION FACILITIES *Final Report*
Feb. 1980 875 p
(PB80-154560; EPA-340/1-80-004) Avail: NTIS HC A99/MF A01 CSCL 13B

The probable compliance status and related facility information for major stationary sources of air pollution are presented. The information reported is not intended to represent the true legal status of facilities with respect to applicable air pollution regulations but rather those facilities of interest to the states or the EPA for further investigation. GRA

N80-25953# Environmental Monitoring and Support Lab., Research Triangle Park, N. C.
MEASUREMENT OF PERCHLOROETHYLENE IN AMBIENT AIR *Final Report, Mar. 1978 - Feb. 1979*
G. F. Evans, R. E. Baumgardner, J. E. Bumgarner, P. L. Finkelstein, J. E. Knoll, A. L. Sykes (Res. Triangle Inst., Research Triangle Park, N.C.), D. E. Wagoner (Res. Triangle Inst., Research Triangle Park, N.C.) and C. E. Decker (Res. Triangle Inst., Research Triangle Park, N.C.) Aug. 1979 203 p refs
(PB80-144678; EPA-600/4-79-047) Avail: NTIS HC A10/MF A01 CSCL 13B

The monitoring of perchloroethylene (i.e., tetrachloroethylene) an organic solvent widely used in dry cleaning and industrial metal degreasing operations is discussed. Short term field studies were conducted in each of three major metropolitan areas which were selected on the basis of the number, density and size of perchloroethylene emission sources as well as the proximity of such sources to centers of high population density. GRA

N80-25954# Environmental Monitoring and Support Lab., Research Triangle Park, N. C. Quality Assurance Div.
TEST METHODS TO DETERMINE THE MERCURY EMISSIONS FROM SLUDGE INCINERATION PLANTS
W. J. Mitchell, M. R. Midgett, J. C. Suggs, and D. Albrinck (PEDCo Environmental, Inc., Cincinnati, Ohio) Sep. 1979 59 p refs
(PB80-144611; EPA-600/4-79-058) Avail: NTIS HC A04/MF A01 CSCL 13B

Two test methods for mercury are described along with the laboratory and field studies done in developing and validating them. One method decribes how to homogenize and analyze large quantities of sewage sludge. The other test method describes how to measure the mercury emissions from the stacks of sewage sludge incinerators. In this latter method, the samples are collected in a potassium permanganate/sulfuric acid solution and analyzed for mercury using flameless atomic absorption spectrometry. GRA

N80-25955# Environmental Measurements, Inc., San Francisco, Calif.
CROSS-COUNTRY URBAN AND RURAL MEASUREMENTS OF NOx AND SO2 *Final Report*
Lee Langan, Michael A. Peache, Jean Jacques Garbarz, Ralph E. Baumgardner, and Robert K. Stevens Jan. 1980 75 p
(PB80-137227; EPA-600/2-80-023; Contract EPA-68-02-2484) Avail: NTIS HC A04/MF A01 CSCL 13B

Total sulfur and oxides of nitrogen measurements, gathered along two long distance routes across the United States, are presented. Supportive information describing the instrumentation, procedures, moving laboratory, and regional meteorological conditions are provided. Over 300,000 measurements were made. points consisting of ten measurement averages were plotted; they are also presented in a graphic analysis. This analysis consists of frequency distribution plots of segments of the trip, for example, through rural areas and crossing urban developments. These plots provide a means of classification of the degree of pollution present and monitored with this moving laboratory technique. The laboratory stopped at six rural locations to record time averaged data, which are also presented. GRA

N80-25956# Chesapeake Research Consortium, Inc., Annapolis, Md.
PHYSICAL ALTERATIONS OF COASTAL SHORELINES: AN ANALYSIS OF CHESAPEAKE BAY SHORE ZONE DEVELOPMENT AND REGULATION
William H. Queen, ed. Mar. 1979 103 p refs
(Grant NSF AEN-74-22179)
(PB80-149875; CRC-PUB-64; NSF/RA-790178) Copyright. Avail: NTIS HC A06/MF A01 CSCL 13B

Shore zone modification and regulations are analyzed. The principal patterns, trends, and rates of physical alterations of the edges of the Chesapeake Bay are identified and their environmental significance is examined. Survey results are used to evaluate the policies and programs affecting environmental quality and land use in the region. GRA

N80-25957# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DEVELOPMENT OF AN AUTOMATIC H2SO4 MONITOR *Final Report, Sep. 1977 - Oct. 1978*
B. A. Knight and F. F. Brooks Jul. 1979 78 p
(Contract EPA-68-02-2165)
(PB80-138191; EPA-600/7-79-153) Avail: NTIS HC A05/MF A01 CSCL 14B

The development, construction, and testing of a prototype automatic H2SO4 vapor and aerosol monitor are described. The monitor is capable of continuous unattended operation for a 24 hour period in streams of moderate (5 g/cu m) particulate loadings. Readings of solution conductivity are recorded continuously, and new samples of the gas stream for analysis are obtained every 10 minutes. The H2SO4 concentration is determined from the instrument and associated calibration curves within 5 minutes of sample acquisition. The prototype detects H2SO4 concentrations in the range of 0.5 to 500 ppm , at temperatures up to 300 C, with 3000 ppm SO2, 8-16% H2O, and up to 9 g/cu m of particulate matter in the gas stream. GRA

N80-25958# Southern Research Inst., Birmingham, Ala.
PARTICULATE SAMPLING AND SUPPORT: EXECUTIVE SUMMARY *Final Report, Nov. 1975 - Nov. 1978*
Kenneth M. Cushing Nov. 1979 50 p
(Contract EPA-68-02-2131)
(PB80-149883; SORI-EAS-79-415) Avail: NTIS HC A03/MF A01 CSCL 13B

Many aspects of particulate sampling and measurement in industrial gaseous process and effluent streams were reviewed. Cascade impactors were calibrated and evaluated. Novel particle sampling cyclones were designed and evaluated. Technical and procedures manuals were prepared for control device evaluation and particle sampling methods. An electrostatic precipitator backup was designed for high flow rate systems. Advanced concepts in monitoring particle mass and size, using optical systems, were evaluated. A detailed examination of the results is also included. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N80-25959 Alaska Univ., College.
THE PLASMA BOUNDARY LAYER AND MAGNETOPAUSE LAYER OF THE EARTH'S MAGNETOSPHERE *Ph.D. Thesis*
Timothy Eric Eastman 1979 262 p
Avail: Univ. Microfilms Order No. 8013052

Observations of the plasma boundary layer (PBL) and magnetopause layer (MPL) of the Earth's magnetosphere by IMP 6 indicate that plasma in the low latitude portion of the PBL is supplied primarily by direct transport of magnetosheath plasma across the MPL and that this transport process is relatively widespread over the entire sunward magnetospheric boundary. The MPL is defined as the current layer, separating the magnetosheath from the PBL, through which the magnetic field shifts in direction. High temporal resolution data reveal that in all IMP 6 crossings, some magnetosheath-like plasma is observed earthward of the MPL, which implies the existence of the PBL. Bulk plasma flow in the low latitude part of the PBL

as observed by IMP 8 almost always has an anti-sunward component and often has a significant cross field component. A brief analysis of the lower hybrid drift instability indicates that it can provide substantial cross field diffusion and thus contribute to the PBL population. A comparison of various theoretical descriptions of the solar wind-magnetosphere interaction illustrates the problems posed for all theoretical models. Dissert. Abstr.

N80-25960 Washington Univ., Seattle.
BAROCLINIC WAVE VACILLATIONS Ph.D. Thesis
Byron Arthur Boville 1979 135 p
Avail: Univ. Microfilms Order No. 8013497

Previous studies of amplitude vacillation, both experimental and theoretical, are briefly reviewed. A nonlinear numerical model is constructed in spectral form, based on the quasi-geostrophic equations for a two layer fluid. A number of model integrations are performed using the f plane geometry. For small departures from the critical conditions for baroclinic instability, the model confirms the analytic theory. For large instability, significant deviations occur due to the nonlinear interactions of the primary wave with the other waves in the model. A number of model integrations are performed using beta plane geometry, which more closely simulates the midlatitude dynamics on the Earth than does the f plane. The integrations produce very different results from those obtained by the asymptotic f plane theory, or even by the f plane numerical model. Vacillations are still present for moderate dissipation and sufficiently large latitudinal thermal gradients. However, the structure and dynamics of the vacillation cycles are much different from those on the f plane.
Dissert. Abstr.

N80-25961 Southern Methodist Univ., Dallas, Tex.
ENERGY DISSIPATION OF RAYLEIGH WAVES DUE TO ABSORPTION ALONG THE PATH OF THE USE OF FINITE-ELEMENT METHOD Ph.D. Thesis
Ali A. Feizpour 1979 164 p
Avail: Univ. Microfilms Order No. 8013063

A Normally incident Rayleigh wave may be used for the investigation of a general vertical boundary and the attenuation of a viscoelastic medium. Use of energy conservation and proper boundary condition produce N second order differential equations, N being the number of viscoelastic layers in the medium. The homogeneous part of the differential equations can be transformed into an eigenvalue problem by the use of finite element technique; the eigenvalue and eigenvectors of the eigenvalue problem are the wave numbers and the displacement amplitudes of the viscoelastic layered medium. The real and imaginary parts of wave number determine the phase velocity and the attenuation of the layered medium, respectively. Dispersion and the attenuation curves can be obtained by using different periods. The above wave numbers can be used in the inhomogeneous differential equation; this equation contains the effect of the vertical boundary; solution of this equation determines the displacement at the vertical boundary. The displacements at the left and right sides of the boundary may be used in the energy equation to determine the reflected and the transmitted energy, respectively. The difference between the incident and transmitted energy determines the difference between the wave numbers at the left and right hand sides of the vertical boundary. Addition of these differences to the wavenumbers of the left hand boundary would result in the formation of the dispersion curve at the right hand boundary.
Dissert. Abstr.

N80-25962 Washington Univ., Seattle.
AN ENERGY-BALANCE CLIMATE MODEL WITH SEPARATE LAND AND OCEANIC EFFECTS Ph.D. Thesis
Cho-Teng Liu 1979 124 p
Avail: Univ. Microfilms Order No. 8013558

An annually and zonally averaged, energy-balanced climate model was developed. The effects of land and oceans were considered separately. The interaction between atmosphere and ocean, the interaction between the atmosphere over ocean and the atmosphere over land, the atmosphere moisture transport, and the ice-albedo feedback were included features. The atmospheric circulation, the cloud cover, and the latitudinal shape function for precipitation were assumed to be independent of the climatic state. The major tuning parameters were the atmospheric and oceanic latitudinal diffusivities, and then present percentage of insolation reaching the Earth surface under clear sky. The result of a tuned model simulates well the observed latitudinal dependence of the sea-surface temperature, the surface air temperature, the difference between precipitation and evapotranspiration, the poleward energy transport and the planetary shortwave albedo.
Dissert. Abstr.

N80-25963 Washington Univ., Seattle.
THE COMBINATION OF AERIAL AND TERRESTRIAL PHOTOGRAMMETRY IN STRUCTURAL MONITORING Ph.D. Thesis
John Nicholas Hatzopoulous 1979 178 p
Avail: Univ. Microfilms Order No. 8013533

The foundation for the method of combination of aerial and terrestrial photogrammetry in structural monitoring is provided by the theory of the standard bundle method of analytical phototriangulation. The traditional bundle method with some small modifications is summarized. The theoretical development of a rigorous adjustment method with proper algorithmic formulation for monitoring applications is outlined. The proper geometric configuration of a photogrammetric monitoring project which combines aerial and terrestrial photography based on a simulation experiment is established. Photogrammetric monitoring of a gabion wall based on four sets of data which involve aerial photography in a three year period of survey is assessed.
Dissert. Abstr.

N80-25964*# Illinois Univ., Urbana.
ROCKET MEASUREMENTS OF ELECTRON TEMPERATURE IN THE E REGION
R. K. Zimmerman, Jr. and L. G. Smith 1 Apr. 1980 173 p refs
(Grant NGR-14-005-181)
(NASA-CR-163210; UILU-ENG-80-2501; Aeronomy-92) Avail: NTIS HC A08/MF A01 CSCL 04A

The rocket borne equipment, experimental method, and data reduction techniques used in the measurement of electron temperature in the E region are fully described. Electron temperature profiles from one daytime equatorial flight and two nighttime midlatitude flights are discussed. The last of these three flights, Nike Apache 14.533, showed elevated E region temperatures which are interpreted as the heating effect of a stable auroral red arc.
Author

N80-25965*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NASA-JSC OZONE OBSERVATIONS FOR VALIDATION OF NIMBUS 7-LIMS DATA
Donald E. Robbins Apr. 1980 44 p refs
(NASA-TM-58227; JSC-16498) Avail: NTIS HC A03/MF A01 CSCL 04A

A series of balloon flights undertaken to validate data received from the limb infrared monitor of the stratorphere instrument aboard the Nimbus 7 satellite is discussed. Ozone data profiles, which included altitude, pressure, and mixing ratio, obtained during both ascent and descent of the balloons are reported. The measurement concept, instrumental uncertainties, and temporal variations observed for several time periods are discussed.
Author

N80-25966*# National Aeronautics and Space Administration, Washington, D. C.
NASA GEODYNAMICS PROGRAM Annual Report, 1979
May 1980 65 p refs
(NASA-TM-81978) Avail: NTIS HC A04/MF A01 CSCL 08G

The history and development of the geodynamics program are described, in addition to accomplishments and plans for the future years activities. Extramural grant titles are listed for general research, Lageos investigations, and Magsat investigations. E.J.R.

N80-25967*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INITIAL GEOMAGNETIC FIELD MODEL FROM MAGSAT
R. A. Langel, R. H. Estes (Business and Technological Systems, Seabrook, Md.), G. D. Mead, E. B. Fabiano (USGS, Denver, Colo.), and E. R. Lancaster Apr. 1980 19 p refs Submitted for publication

(NASA-TM-80679) Avail: NTIS HC A02/MF A01 CSCL 04A

Magsat data from magnetically quiet days were used to derive a thirteenth degree and order spherical harmonic geomagnetic field model, MGST(3/80). The model utilized both scalar and vector data and fit that data with standard deviations of 8, 52, 55 and 97 nT for the scalar magnitude, B sub r, B sub theta and B sub phi respectively. When compared with earlier models, the Earth's dipole moment continues to decrease at a rate of about 26 nT/year. Evaluation of earlier models with Magsat data shows that the scalar field at the Magsat epoch is best predicted by the POGO(2/72) model but that the AWC/75 and IGS/75 are better for predicting vector fields. Author

N80-25968# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ON THE EFFICIENCY OF MERIDIONAL EDDY TRANSPORT PROCESSES DURING THE MAJOR STRATOSPHERIC WARMING OF JANUARY 1977

Vadlamudi Brahmananda Rao and Jose Paulo Bonatti Mar. 1980 21 p refs Revised Submitted for publication

(INPE-1687-RPE/118) Avail: NTIS HC A02/MF A01

Correlation coefficients between the meridional wind and zonal wind and meridional wind and temperature measure the efficiencies of eddy transports of momentum and heat respectively. Efficiencies are calculated in terms of these correlation coefficients for the major warming event of January 1977. It is found that the eddies are more efficient in transporting heat than in transporting momentum. Further, the efficiency of heat transport increased substantially before the meridional temperature gradient reversed. Increase of efficiency in heat transport is found to be related to the increased westward tilt of a wave in the height field. Since this tilt is known to be associated with vertical propagation of wave energy, interesting connections are inferred between the efficiencies of eddy transports, wave structure, and energetics during a stratospheric warming. Author

N80-25969# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

LONGITUDINAL AND LATITUDINAL ABNORMALITIES IN THE DAILY VARIATION OF f0F2 IN THE SOUTH AMERICAN REGION

R. P. Kane Apr. 1980 30 p refs Revised Submitted for publication

(INPE-1722-RPE/127) Avail: NTIS HC A03/MF A01

The daily variation characteristics of f0F2 at locations in the South American region were studied for the IGY period. For pairs of stations at roughly similar dip latitudes, but either in different hemispheres or at different longitudes in the same hemisphere (particularly southern), considerable differences, qualitative as well as quantitative, were observed. Whereas the possibility that these are due to differences in electrodynamic effects, cannot be ruled out, it is suggested that irregular precipitation of low energy electrons from the magnetosphere could also be a possible cause. Author

N80-25970# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPARISON OF f0F2 CHARACTERISTICS AT NEARBY EQUATORIAL LOCATIONS IN THE SOUTH AMERICAN REGION

R. P. Kane May 1980 16 p refs Revised Submitted for publication

(INPE-1737-RPE/136) Avail: NTIS HC A02/MF A01

The daily variation characteristics of ionospheric f0F2 at two locations on the magnetic equator in the American region viz. Huancayo (12 deg S, 75 deg W, Dip angle 2 deg N) and Natal (5 deg S, 35 deg W, dip angle 1 deg - 2 deg S in 1958 - 62) show considerable differences. Possible causes could be differences in electrodynamic effects and/or particle precipitation from magnetospheric regions at Natal, which is near the South Atlantic Geomagnetic Anomaly. Author

N80-25971# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

EXAMINATION OF THE EMPIRICAL FLUX-PROFILE MODELS IN THE ATMOSPHERIC SURFACE BOUNDARY LAYER

Y. Viswanadham May 1980 28 p refs Revised Submitted for publication

(INPE-1747-RPE/140) Avail: NTIS HC A03/MF A01

Values of Richardson number (Ri) and the wind profile Deacon number (beta) in the atmospheric surface layer are evaluated from the different experimental data sources. The relationship between Ri and beta shows some scatter, but gives agreement with the theoretical relations derived by empirical models for unstable conditions and for inversion conditions. J.M.S.

N80-25972# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ASSOCIATION BETWEEN PLASMA BUBBLE IRREGULARITIES AND AIRGLOW DISTURBANCES OVER BRAZILIAN LOW LATITUDES

J. H. A. Sobral, M. A. Abdu, C. J. Zamlutti, and I. S. Batista May 1980 9 p refs Revised

(INPE-1748-RPE/141) Avail: NTIS HC A02/MF A01

Meridional profiles of OI 6300 A nightglow emission mearured using a scanning photometer over Cachoeira Paulista, a low latitude station, show propagating patches of airglow disturbances with north to south and west to east velocity components, occuring mostly in the premidnight period. Measurements carried out during a period of 26 months since January 1978, show significant seasonal dependence in the occurance of these disturbances, with most of the event occuring in the spring to summmer months and with very rare occurance during the winter solstice. The north to south propagation velocities lie in the range of 150 to 350 m/s. A case by case comparison of the occurrences of these airglow disturbances with simultaneous ionograms over Cachoeira Paulista show that almost the totality of these disturbances are accompanied by strong range type echoes in the ionograms and vice versa. These results therefore support the earlier contention that these types of airglow disturbances might be manifestations of the equatorial ionospheric plasma bubbles. J.M.S.

N80-25973# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MAGNETOPAUSE RECONNECTION

W. D. Gonzales Jan. 1980 42 p refs Revised Submitted for publication

(INPE-1667-RPE/106) Avail: NTIS HC A03/MF A01

A revised model is presented to compute the electric potential of reconnection at the magnetopause for nonpolar geomagnetic field lines as a function of solar wind parameters. The model incorporates the recently claimed role that the Bx component of the interplanetary magnetic field seems to play in magnetopause reconnection, introducing a north-south asymmetry to the geometry of reconnection and consequent convection. This model is also extended to the cases when magnetopause reconnection on polar field lines becomes important. The Bx effect seems to be of the same nature, both, for magnetopause reconnection on nonpolar as well as on polar geomagnetic field lines, large (small) values of Bx result in a smaller (larger) reconnection potential. Author

N80-25974# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).

SPACED LIDAR AND NIGHTGLOW OBSERVATIONS OF AN ATMOSPHERIC SODIUM ENHANCEMENT

B. R. Clemesha, V. W. J. H. Kirchhoff, D. M. Simonich, H. Takahashi, and P. P. Batista Jan. 1980 21 p refs Submitted for publication

(INPE-1675-RPE/110) Avail: NTIS HC A02/MF A01

On the night of August 25 and 26, 1979, a large enhancement was observed in the density of atmospheric sodium at a height of 95 km. The enhancement, lasting about 15 minutes and extending over a height range of about 2 km, was observed at three positions about 50 km apart. Increases in sodium airglow occurring almost simultaneously were observed at two points separated by 107 km. From the time lags between the occurrence of the enhancement at the various measuring points, it is concluded that it was caused by the horizontal motion of a cloud of sodium with a density about 10 times the normal density at the peak of the sodium layer. The cloud appears to have been moving in an approximately SW direction with a velocity of the order of 200 m/s. On the assumption that the sodium was of meteoric origin, it is concluded that a minimum of 10 kg of meteoric

material was necessary for its formation. From the magnitude of the observed increases in sodium abundance and sodium airglow, a value of 3 x 10 to the 13th power/cu m is derived for the ozone density at 95 km. Author

N80-25975# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
EQUATORIAL COUNTERELECTROJET: TWO DISTINCT CATEGORIES
R. P. Kane Feb. 1980 8 p refs Revised
(INPE-1683-RPE/114) Avail: NTIS HC A02/MF A01

It is shown that among the equatorial counterelectrojets, there are two distinct categories, the fast one and the slow one, having different characteristics. Author

N80-25976# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
SOME OBSERVED AND THEORETICAL ASPECTS OF THE SUDDEN STRATOSPHERIC HEATING IN THE NORTHERN AND SOUTHERN HEMISPHERES M.S. Thesis [ALGUNS ASPECTOS OBSERVADOS E TEORICOS DO AQUECIMENTO ESTRATOFERICO BRUSCO NOS HEMISFERIOS SUL E NORTE]
Jose Paulo Bonatti Jan. 1980 144 p refs In PORTUGESE; ENGLISH summary
(INPE-1671-TDL/016) Avail: NTIS HC A07/MF A01

Synoptic and dynamic characteristics of the stratospheric warming of January 1977 in the Northern Hemisphere and the final warming of 1969 in the Southern Hemisphere are discussed. In the Northern Hemisphere case many of the features of the warming event are similar to those of a major warming while in the Southern Hemisphere the warming is shown to be minor. Synoptic charts, calculations of the scale and kinetic energy distribution as a function of wavelength, show that planetary scale waves dominated before the warming and shorter waves became important after the warming. The generation of short waves might be due to barotropic instability or nonlinear interaction. Calculation of the efficiency of eddy transports of momentum and heat shows some interesting results. Eddies seem to be more efficient in transporting heat than momentum. Further, efficiency of heat transport increases substantially before the warming. Energetics of the 1977 warming event show many similarities to the previous calculations, although the (K sub E, K sub Z) conversion was different. J.M.S.

N80-25977# Wentworth Inst., Boston, Mass.
DESIGN AND FABRICATION OF QUADRUPOLE ION MASS SPECTROMETER FOR UPPER ATMOSPHERE Scientific Report, 1 Oct. 1577 - 30 Sep. 1978
M. McDonald Dec. 1979 13 p 2 Vol.
(Contract F19628-78-C-0017; AF Proj. 1703)
(AD-A083019; AFGL-TR-80-0024; SR-1) Avail: NTIS HC A02/MF A01 CSCL 14/2

The cluster ion mass spectrometer consists of a two piece cone section with the top cone section electrically biased with respect to the lower cone. The front cone has an orifice opening of .03 -.04 in. diameter for ion sampling. The cone assembly was attached to a liquid helium cooled cryo pump supplied by another contractor. Attached to the bottom side of the liquid helium cryo pump is the base plate. 'O' rings provided the vacuum seal between the base plate and cryo pump. Rod housing was fixed to the base plate and extended upward through the pump section. A RF quadrupole assembly extended to the upper region of the front cone sampling area and downward to an ion detecting electronic multiplier. An aluminum ring was externally attached to the base plate to support the electronics section of the instrument. This section consisted of a series of leg supports to which was attached a deck plate to hold an electronics oscillator box and an assortment of other housekeeping equipment. Below this deck and mechanically to it is a complex cast aluminum housing of electronic equipment. This entire section was enclosed with a vacuum tight electronic cover can. GRA

N80-25978# Wentworth Inst., Boston, Mass.
DESIGN AND FABRICATION OF QUADRUPOLE ION MASS SPECTROMETER FOR UPPER ATMOSPHERE Scientific Report, 1 Oct. 1978 - 30 Aug. 1979
M. McDonald Dec. 1979 10 p 2 Vol.
(Contract F19628-78-C-0017; AF Proj. 6687)
(AD-A083022; AFGL-TR-80-0025; SR-2) Avail: NTIS HC A02/MF A01 CSCL 14/2

The material contained in this report describes in a quasi-historical format the design and fabrication of component parts and assemblies used in an Upper Atmosphere Composition Research Program conducted by the Composition Branch of the Aeronomy Laboratory, for AFGL. GRA

N80-25979# Colorado State Univ., Fort Collins. Solar Energy Application Lab.
VARIABILITY OF SOLAR RADIATION AT FOUR SELECTED STATIONS IN THE UNITED STATES Final Report, 1 Oct. 1977 - 30 Sep. 1978
Hsieh Wen Shen and Wen Chiang Wang Oct. 1979 99 p refs
(Contract EG-77-S-02-4521)
(COO-4521-1) Avail: NTIS HC A05/MF A01

The solar radiations considered are the total of direct and diffuse radiant energies received on a horizontal surface at ground level by a pyranometer during solar hours. Four stations, at Seattle-Tacoma, Washington; Madison, Wisconsin; Charleston, South Carolina; and Albuquerque, New Mexico were selected to represent different climatic conditions across the United States. The data were obtained from the National Climatic Center, Asheville, North Carolina. The data can be fitted by either a normal or gamma distribution and, for simplicity, a normal distribution was used. The coefficients of variation for all stations over the years were relatively low, and in general, were lower for summer months than for winter months. Of the four stations tested, Albuquerque had the lowest coefficients of variation and Seattle-Tacoma had the highest. It was estimated that no more than 16 years of records are needed for any of these stations to estimate a mean value which is within 10% of the true mean. Both the continuous daylight hours of high solar radiation (over 1100 kJ/sq m/hr) and the accumulated hourly solar radiation for these durations were studied. DOE

N80-25980# Los Alamos Scientific Lab., N. Mex.
PROCEEDINGS OF THE ATMOSPHERIC TRACERS AND TRACER APPLICATION WORKSHOP
Sumner Barr, comp. and Teymoor Gadayloo, comp. Dec. 1979 161 p refs Workshop held in Los Alamos, N. Mex., 22-24 May 1979
(Contract W-7405-eng-36)
(LA-8144-C; CONF-790510B) Avail: NTIS HC A08/MF A01

A number of low level background tracers such as heavy methanes and perfluorocarbons were discussed. Multiply labeled isotopes such as C-13(18)O2, helium 3 were covered in addition to sample collection techniques and analytical methods for various tracers. DOE

N80-25981# California Univ., Livermore. Lawrence Livermore Lab.
SEISMIC SAFETY MARGINS RESEARCH PROGRAM LOAD COMBINATION PROJECT. TASK 3: LOAD COMBINATION METHODOLOGY DEVELOPMENT
C. K. Chou, R. W. Mensing, P. D. Smith, K. Vepa, J. D. Collins (Wiggins (J. H.)Co., Redondo Beach, Calif.), C. A. Cornell (MIT, Cambridge), R. P. Kennedy (Structural Mechanics Assoc.), and M. K. Ravindra (Sargent and Lundy Engrs.) 31 Jan. 1980 89 p refs
(Contract W-7405-eng-48)
(UCID-18149; IR-1) Avail: NTIS HC A05/MF A01

A load combination methodology is presented. User oriented requirements on the methodology are discussed. Examples of similar applications of the reliability based methodology are presented and accompanied by a listing of some of the unique considerations in applying this type of methodology to nuclear design. A fairly detailed exposition of a component reliability and design code optimization scheme is given along with a brief discussion of system and plant reliability considerations. DOE

N80-25982# Northrop Services, Inc., Huntsville, Ala.
SOLAR RADIATION DATA FORECAST AND INTERPOLATION ANALYSIS. FOLDER 1, PART 1: EXECUTIVE SUMMARY. PART 2: TECHNICAL ANALYSIS (TASKS 1 AND 2). PART 3: APPENDICES (TASKS 1 AND 2) Final Report

John Woo, Jr. Apr. 1979 184 p refs
(Contract EG-77-C-02-4494)
(COO-4494-1) Avail: NTIS HC A09/MF A01

Data were evaluated from the rehabilitated 52 station SOLMET solar radiation network. Techniques were established to transform radiation measurements taken on a horizontal surface to an inclined surface. A climatological cell statistics (CCS) method was developed to obtain the statistics of up to 24 variables occurring in combination with each other using surface meteorological data and to relate these statistics to the solar radiation measurements. A method to evaluate the differences between two insolation data sets, called the Wedge method, was developed to determine the representative area of a radiation measurement site. These methods were used to evaluate the capabilities of the NOAA solar radiation model to interpolate between measurement sites. Twenty-four methods of calculating solar radiation on inclined surfaces were investigated. All algorithms were rewritten in a common convention and nomenclature and the measurements required for each method were categorized. DOE

N80-25983# Alaska Univ., Fairbanks. Inst. of Water Resources.
DETERMINATION OF SELECTED HYDRAULIC PROPERTIES OF SUBARCTIC SOILS
Douglas L. Kane Jan. 1980 30 p refs
(Contract DI-14-34-0001-9002)
(PB80-150956; COMPLETION-78-22; WB0-03648; OWRT-A-064-ALAS(3)) Avail: NTIS HC A03/MF A01 CSCL 08M

The critical hydraulic properties of partially frozen soils were studied to aid in the evaluation of potential groundwater recharge and in forecasting surface runoff. Specific areas examined were: (1) the redistribution of moisture in near-surface soils during winter; (2) infiltration rates for partially frozen soils; (3) the role of soil moisture content in runoff generation; (4) the hydrologic significance of surface organic soils; and (5) the importance of permafrost terrain in surface runoff generation. GRA

N80-25984# Geological Survey, Menlo Park, Calif. Seismic Engineering Branch.
SEISMIC ENGINEERING PROGRAM Progress Report, Jan. - Apr. 1979
R. L. Porcella Apr. 1979 27 p refs
(Grant NSF CA-114)
(PB80-149909; USGS-818-A; NSF/RA-790354) Avail: NTIS HC A03/MF A01 CSCL 08K

A summary of accelerograms recovered from the Geological Survey's National Strong Motion Network during the period January 1 through April 30, 1979 is given. Also described is strong motion instrumentation in Imperial Valley, California. The seismicity of this region has been characterized by both earthquake swarms as well as mainshock-aftershock activity. Summaries of recent reports include information on earthquakes at Milford Sound, New Zealand; Santa Barbara, California; Bishop, California; St. Elias, Alaska; and Monte Negro, Yugoslavia. The availability of strong-motion information data reports, digitalized data, and additional information pertinent to strong-motion programs is presented. GRA

N80-25985# Geological Survey, Menlo Park, Calif.
THE TORSIONAL PENDULUM TEST FOR SOILS: A THEORETICAL INVESTIGATION
Albert T. F. Chen Jan. 1980 38 p refs
(PB80-154115; USGS/GD-80/003) Avail: NTIS HC A03/MF A01 CSCL 08M

A theoretical investigation of the torsional pendulum test for soils and its associated interpretation procedure is presented. By calculating the nonlinear, free-vibration response of known torsional testing systems, it was possible to examine the validity of existing interpretation procedures and to suggest improvements for them. Among the improvements suggested are the concept of effective displacement, the determination of vibration period, and the use of acceleration amplitudes for the logarithmic decrement in damping computation. It is also shown that, in theory, the torsional pendulum test can be an effective tool for testing the Masing's criterion and for determining the non-hysteretic damping component of soils. Author (GRA)

N80-26258# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
BIRAMIS: DIRECT MEASUREMENT OF THE EARTH RADIATION BUDGET BY MEANS OF AN ACCELEROMETER IN SPACE
Anne-Marie Mainguy, Alain Bernard, Manola Romero, Jacques Boutties, and Francois Barlier (CERGA, Grasse, France) *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 1-9 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 9 p Presented at the Ann. Congr. of the French Phys. Soc., Toulouse, 25-30 Jun. 1979 Original report in FRENCH previously announced as A79-43634 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-25986 Wisconsin Univ. - Madison.
VORTEX GENERATION IN A NESTED GRID NUMERICAL THUNDERSTORM MODEL Ph.D. Thesis
Jerome Bert Blechman 1979 139 p
Avail: Univ. Microfilms Order No. 8008805

A nested grid was embedded in a three dimensional numerical thunderstorm model. The resulting grid resolution (1.25 km x 1.25 km) was fine enough to allow detailed analysis of mesocyclone formation in numerical storm clouds. The vorticity equation was used to determine the rates of generation or advection of vorticity in the modeled mesocyclones. Experiments were run with varied base state wind profiles to help determine the role of vertical wind shear in generation of vortices within thunderstorms. Analysis of mechanisms involved in vortex growth showed that, during early and mature storm regimes, important contributions were made by three processes: tilting of horizontal vorticity into the vertical stretching of these vortices by wind convergence and vertical advection of vorticity. The combination of these three processes served to create strong cyclonic and anticyclonic vortex couples through extensive vertical columns in the modeled storms. In many respects the cyclonic vortices were favored over the anticyclonic ones. These included the generation of more positive than negative vorticity, the locations of each vortex within the storms in relation to the updrafts, and smaller tilts from vertical in the cyclonic vortices. Dissert. Abstr.

N80-25987 Hawaii Univ., Honolulu.
CHARACTERISTICS OF THE WINTER MONSOON OVER THE MALAYSIAN REGION Ph.D. Thesis
Joo Tick Lim 1979 234 p
Avail: Univ. Microfilms Order No. 8012262

Two periods, a strong and weak monsoon period, are chosen from the winter monsoon of 1974/75 for the study of some characteristics of the monsoon over the Malaysian region. In the strong monsoon period, it is found that a time lag of about three days existed between the cold surge arrival at Hong Kong and the occurrence of heavy rainfall over the east coast of Peninsular Malaysia. Interaction between the quasi-stationary near equatorial trough and monsoon surge caused the heavy rainfall over Malaysia. Mean maps of various radiative parameters for Southeast Asia for the two periods are analyzed. Of interest is the albedo map for the surge period, which indicates the maximum albedo (convective activity) areas were confined largely to the Peninsular Malaysia-South Thailand-South bay of Bengal region. Composite maps of surface wind speed, air temperature, dewpoint and sea surface temperature (SST) over the South China Sea are prepared. It is found that a strong wind band was aligned along the general wind direction during the monsoon surge. The strong wind band formed the main surface branch of the Hadley cell while the intense convective activity region, which lay downwind of the strong wind band, became the main ascending branch. In general, the distribution of SST, air temperature and dewpoint during the strong monsoon period showed large

gradients north of 15N. To the south of 15N, they were relatively uniform. Dissert. Abstr.

N80-25988 Washington Univ., Seattle.
A MODEL FOR MODIFICATION OF THE CLOUD-TOPPED MARINE BOUNDARY LAYER DURING COLD AIR OUTBREAK Ph.D. Thesis
Steven Arthur Stage 1979 290 p
Avail: Univ. Microfilms Order No. 8013598

A model is developed for the growth and evolution of a planetary boundary layer over warm water. The model includes the possible presence of a stratocumulus could layer in the upper part of the boundary layer, surface fluxes of latent and sensible heat, radiation at the cloud top and bottom, divergence, and entrainment. All air with positive buoyancy flux is assumed to produce turbulence kinetic energy (TKE) and the integrated rate of dissipation is assumed to be proportional to the total production in the layer. The entrainment rate is then obtained from the amount of energy required to mix entrained air uniformly throughout the layer and use of the TKE equation. The model is applied to a situation of cold air outbreak over Lake Ontario during the International Field Year for the Great Lakes (IFYGL). When computations are done beginning with soundings from the north shore, model soundings for the south shore give good agreement with soundings measured there. Tests are made which demonstrate the size of terms in the budget equations of the model during a typical cold air outbreak situation. Surface fluxes are the principal sources of the modification of the boundary layer. Radiative cooling of the cloud top is also important to the heat budget of the layer and in production of TKE and resulting entrainment. Dissert. Abstr.

N80-25989*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RAIN RATE RANGE PROFILING FROM A SPACEBORNE RADAR
Robert Meneghini Mar. 1980 28 p refs
(NASA-TM-80656) Avail: NTIS HC A03/MF A01 CSCL 04B

At certain frequencies and incidence angles the relative invariance of the surface scattering properites over land can be used to estimate the total attenuation and the integrated rain from a spaceborne attenuation-wavelength radar. The technique is generalized so that rain rate profiles along the radar beam can be estimated, i.e., rain rate determination at each range bin. This is done by modifying the standard algorithm for an attenuating-wavelength radar to include in it the measurement of the total attenuation. Simple error analyses of the estimates show that this type of profiling is possible if the total attenuation can be measured with a modest degree of accuracy. A.R.H.

N80-25990# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE MOMENTUM TRANSPORT BY THE STATIONARY WAVES FORCED BY THE TOPOGRAPHY
Prakki Satyamurty and Vadlamudi Brahamanda Rao Apr. 1980 24 p refs Revised
(INPE-1720-RPE/125) Avail: NTIS HC A02/MF A01

A steady barotropic primitive equation model is solved by spectral methods for the stationary waves forced by topography between 60 N and 60 S. The meridional transports of momentum by these waves are compared with those calculated earlier from observations. The cross equatorial exchange of momentum by these waves is negligible compared to that by observed standing waves and thus the present study suggests the importance of the thermally forced stationary waves. The role of friction in determining the tilt, amplitude and the momentum transport is very crucial. J.M.S.

N80-25991*# Arkansas Univ., Fayetteville. Dept. of Mathematics.
STATISTICAL ANALYSIS OF MULTIVARIATE ATMOSPHERIC VARIABLES Final Report
Jack D. Tubbs 31 Mar. 1979 158 p refs
(Contract NAS8-31550)
(NASA-CR-161472) Avail: NTIS HC A08/MF A01 CSCL 04B

Topics covered include: (1) estimation in discrete multivariate distributions; (2) a procedure to predict cloud cover frequencies in the bivariate case; (3) a program to compute conditional bivariate normal parameters; (4) the transformation of nonnormal multivariate to near-normal; (5) test of fit for the extreme value distribution based upon the generalized minimum chi-square; (6) test of fit for continuous distributions based upon the generalized minimum chi-square; (7) effect of correlated observations on confidence sets based upon chi-square statistics; and (8) generation of random variates from specified distributions. A.R.H.

N80-25992*# Computer Sciences Corp., Huntsville, Ala.
VECTOR WIND PROFILE GUST MODEL Midterm Report, 10 Apr. - 10 Oct. 1979
Stanley I. Adelfang 20 Oct. 1979 145 p
(Contract NAS8-33433)
(NASA-CR-161474) Avail: NTIS HC A07/MF A01 CSCL 04B

Work towards establishing a vector wind profile gust model for the Space Transportation System flight operations and trade studies is reported. To date, all the statistical and computational techniques required were established and partially implemented. An analysis of wind profile gust at Cape Kennedy within the theoretical framework is presented. The variability of theoretical and observed gust magnitude with filter type, altitude, and season is described. Various examples are presented which illustrate agreement between theoretical and observed gust percentiles. The preliminary analysis of the gust data indicates a strong variability with altitude, season, and wavelength regime. An extension of the analyses to include conditional distributions of gust magnitude given gust length, distributions of gust modulus, and phase differences between gust components has begun. R.E.S.

N80-25993*# Computer Sciences Corp., Huntsville, Ala.
VECTOR WIND PROFILE GUST MODEL Final Report, 10 Apr. 1979 - 9 Apr. 1980
Stanley I. Adelfang and Beverly A Evans 9 Apr. 1980 65 p refs
(Contract NAS8-33433)
(NASA-CR-161475) Avail: NTIS HC A04/MF A01 CSCL 04B

A methodology was developed for the derivation and analysis of small scale perturbations in Jimsphere wind profiles. Gusts in various wavelentgh bands have been derived from these perturbations; the probability distribution of gust components and associated gust length has been shown to be accurately represented by a gamma distribution. Theoretical and observed distributions of component gust vary significantly with season, altitude, and wavelength range. The results of this study provide the basis for a vector wind model for Cape Kennedy, Florida. R.E.S.

N80-25994*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A DIFFUSION CLIMATOLOGY FOR CAPE CANAVERAL, FLORIDA
Richard K. Siler Apr. 1980 50 p refs
(NASA-TM-58224) Avail: NTIS HC A03/MF A01 CSCL 04B

The problem of toxic effluent released by a space shuttle launch on local plant and animal life is discussed. Based on several successive years of data, nine basic weather patterns were identified, and the probabilities of pattern occurrence, of onshore/alongshore cloud transport, of precipitation accompanying the latter, and of ground-level concentrations of hydrogen chloride were determined. Diurnal variations for the patterns were also investigated. Sketches showing probable movement of launch cloud exhaust and isobaric maps are presented. R.E.S.

N80-25995# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
TECHNICAL NOTE APT/WEFAX 79-W2 [NOTA TECHNICA APT/WEFAX 79-W2]
Marlene Elias Apr. 1980 18 p In PORTUGUESE
(INPE-1727-NTE/159) Avail: NTIS HC A02/MF A01

Information is presented concerning the schedules, frequencies, and the type of data transmitted by the meteorological geostationary satellites. Transl. by F.O.S.

N80-25996# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
NUMERICAL WEATHER PREDICTION AND ITS OUTLOOK IN BRAZIL [PREVISAO NUMERICA DE TEMPO E SUA PERSPECTIVA NO BRASIL]
Marco Antonio Maringolo Lemes and Antonio Divino Moura Jan. 1980 40 p refs In PORTUGUESE; ENGLISH summary Presented at the 31st Reuniao da SBPC, Fortaleza, Brazil, Jul. 1979
(INPE-1670-RPE/108) Avail: NTIS HC A03/MF A01

A chronological description of the major events, considered milestones in the evolution of Numerical Weather Prediction (NWP) is presented. The scientific problem of NWP is briefly discussed and the basic requirements that must be fulfilled in the implantation of NWP, on an operational basis, are pointed out. Finally, a survey of the state-of-the-art of NWP in Brazil is included, together with an example of a numerical forecast obtained with a primitive equation barotropic model. J.M.S.

N80-25997# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
A HYDROMETEOROLOGICAL MODEL FOR MEDIUM SIZED HYDROGRAPHIC BASINS M.S. Thesis [UM MODELO HIDROMETEOROLOGICO PARA BACIAS HIDROGRAFICAS DE MEDIO PORTE]
Jose Carvalho deMoraes Apr. 1980 145 p refs In PORTUGUESE; ENGLISH summary Revised
(INPE-1729-TDL/025) Avail: NTIS HC A07/MF A01

The model proposed is a technique of hydrometeorological simulation, which consists of assigning mathematical functions for phenomena in hydrological cycle and simulating their interactions. The area under study is divided into finite elements called 'cells'. The water balance is included in every individual cell throughout the simulation. The superficial and channel processes are followed at any point in the basin in such a way that at any time of the simulation an instantaneous microscale picture (view) of the behavior of the basin is obtained. The hydrogram of the cell at the mouth of the river gives the overall behavior. The results obtained with a few hypothetical simulations are compatible with those expected. The tests demonstrate the possibility of simulation of diverse types of precipitation because the input is quite flexible. However, only an application to a true (real) basin could validate the model proposed. The algorithm is implemented in Algol on the B-6700 machine in a very general program which permits modification of the functions used. J.M.S.

N80-25998# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
A CLIMATOLOGICAL STUDY OF THE WIND AND TEMPERATURE FIELDS FOR THE UPPER LEVELS OVER SOUTH AMERICA M.S. Thesis - 1979 [UM ESTUDO CLIMATOLOGICO DOS CAMPOS DE VENTO E DE TEMPERATURA NOS NIVEIS SUPERIORES SOBRE A AMERICA DO SUL]
Zenaide Rosa Sobral Jan. 1980 149 p refs In PORTUGUESE; ENGLISH summary
(INPE-1672-TDL/017) Avail: NTIS HC A07/MF A01

The monthly mean resultant winds and mean temperature maps for South America, for four months of the year, representing the four seasons, (January, April, July and October) were analyzed for the levels 850 mb up to 200 mb - period 1969-1973. Analyses of the wind fields emphasized the positions of the subtropical ridges. The movements of the ridge lines between one year and another are discussed. Apart from these, the annual march of temperatures at various latitudes and the profile of temperatures along meridian 60 deg W are discussed. J.M.S.

N80-25999# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
INTRODUCTION TO INTERPRETING SATELLITE IMAGERY [INTRODUCAO A INTERPRETAGAO DE IMAGENS DE SATELITES]
Michael A. Fortune and Nelson Jesus Ferreira Feb. 1980 75 p refs In PORTUGUESE; ENGLISH summary
(INPE-1681-RPE/113) Avail: NTIS HC A04/MF A01

The basic meteorological concepts necessary for understanding the techniques of cloud system analysis using satellite imagery are outlined. The various types of satellite data and imagery and their diverse applications are included. Atmospheric radiation pertinent to satellite observations, systems of cloud analysis based on cloud appearances and patterns, and the major components of atmospheric circulation are among the topics considered. Photointerpretation of various weather systems, mesoscale and synoptic scale, in both the tropics and the midlatitude is discussed. J.M.S.

N80-26000# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex.
THE 19308B MLRS, MISSILE NO. 1125, ROUND NO. V-98, 11 DECEMBER 1979
Dec. 1979 17 p
(DA Proj. 1F6-65702-D-127)
(AD-A082969; ERADCOM/ASL-DR-1104) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19308B MLRS, missile number 1125, round number V-98 are presented in tabular form. GRA

N80-26001# Atlas Corp., Santa Cruz, Calif.
EVALUATION OF THE TYPICAL METEOROLOGICAL YEARS FOR SOLAR HEATING AND COOLING SYSTEM STUDIES Final Report
Thomas L. Freeman Dec. 1979 77 p refs Prepared for Midwest Research Inst.
(Contract EG-77-C-01-4042)
(SERI/TR-8150-1) Avail: NTIS HC A05/MF A01

A summary is presented of an evaluation of the weather data set, generated at Sandia Laboratories, known as the Typical Meteorological Year (TMY) data. The purpose of the evaluation is to determine how well the TMY data represent actual long term weather data in affecting the performance of solar heating and cooling systems. The two data sets are compared through detailed SHAC simulation. DOE

N80-26002# Brookhaven National Lab., Upton, N. Y.
TRANSPORT AND DIFFUSION CLIMATOLOGY OF THE US ATLANTIC AND GULF COASTS
Gilbert S. Raynor and Janet V. Hayes 1980 4 p refs Presented at 2nd Conf. on Coastal Meteorology (AMS), Los Angeles, 31 Jan. - 1 Feb. 1980
(Contract EY-76-C-02-0016)
(BNL-26891; CONF-800107-4) Avail: NTIS HC A02/MF A01

Coastal meteorology and diffusion were studied to assist in site selection of energy facilities by describing the transport and diffusion climatology. The region studied is within the coastal plain and is generally characterized by flat beaches and very gentle slopes inland. Meteorological variables emphasized are those which govern or influence transport and diffusion of airborne gases and particles. Wind direction and speed and some measure of diffusive capacity such as turbulence, gustiness, or lapse rate are among the factors studied. Differences between day and night in wind direction distribution are shown along with the frequency of the five diffusion rating classes at the same coastal stations during onshore winds. The results obtained are arranged for easy use with diffusion models in which the primary meteorological inputs are wind speed and measure of lateral and vertical diffusion. DOE

N80-26003# California Univ., Livermore. Lawrence Livermore Lab.
CLIMATE PROGRAM PLAN, VOLUME 1
Jan. 1980 90 p refs 2 Vol.
(Contract W-7405-eng-48)
(DOE/EV-0062/1) Avail: NTIS HC A05/MF A01

The perceived and potential effects of energy technologies on climate that merit assessment are discussed along with the need for research on the prediction of weather and climate variations and assessment of their effects on power production. The need for assessing the cycles and budgets of the entire range of substances emitted in power production by the many technologies now in use is emphasized. To provide the basis for assessing the impacts of these emissions, specialized, mission-oriented research to improve understanding of processes that determine how these emissions are transported, transformed, and scavenged in the atmosphere, and of the natural processes that can be affected by energy activities are suggested. This latter category includes potential modification of surface properties caused, for example, by large arrays of solar collectors, extensive

biomass production and wind power modification of the boundary layer. DOE

N80-28004# Argonne National Lab., Ill.
PROCEEDINGS OF THE WORKSHOP ON METEOROLOGICAL EFFECTS OF SATELLITE POWER SYSTEM RECTENNA OPERATION AND RELATED MICROWAVE TRANSMISSION PROBLEMS
Dec. 1979 58 p refs Workshop held at Rosemont, Ill., 23 Aug. 1978 Sponsored by DOE
(CONF-7808114) Avail: NTIS HC A04/MF A01

From Workshop on Meteorological Effects of Satellite Power Systems Rectenna Operation and Related Microwave Transmission Problems; Rosemont, IL, USA (23 Aug. 1978). Discussion at the workshop concentrated on the effects of the Satellite Power System (SPS) on the atmosphere and the effects of the atmosphere on the SPS microwave beam propagation. The three main concerns were the effects on the atmosphere of the estimated 750 MW excess heat released at the SPS rectanna site, the microwave interactions with the atmosphere, possibly causing loss of beam control and scattering of beam energy, and the possible effects of the beam on atmospheric electrification processes. Construction of a rectenna will modify the thermal and radiative properties of the ground, and operations will introduce a heat source at the surface. It was generally agreed that the direct effects of any single causes due to an SPS in the lower atmosphere will be small but detectable in some instances, and that their combined effects need better definition. Variations in the refractive index of the atmosphere and the presence of hydrometeors in the atmosphere cause refraction, scattering, and adsorption of electromagnetic waves. Refractive-index anomalies in the atmosphere may impact on power beam control. The effect of the rectenna waste heat may be studied on two scales: the mesoscale (regional and city sizes, 10 to 100 km) and the cloud scale (10 km and less). At 2.45 GHz the refractive index of air at fixed pressure depends mostly on water vapor and temperature. In the presence of convective or turbulent air motions a spectrum of atmospheric refractivity develops. These variations can lead to beam wandering and spreading. Direct interactions with the atmospheric electricity fields are not thought to be crucial at the 2.45 GHz frequency. However, the mere physical presence of the rectenna might have some modifying influence on the occurrence and electrical behavior of thunderstorms over and around the rectenna. DOE

N80-28005# Arizona Univ., Tucson. Tree-Ring Research Lab.
ESTIMATING LONG-TERM STATISTICS FOR ANNUAL PRECIPITATION FOR SIX REGIONS OF THE UNITED STATES FROM TREE-RING DATA
Harold C. Fritts, Emily DeWitt, Geoffrey A. Gordon, John H. Hunt, and G. Robert Lofgren Dec. 1979 99 p refs
(Contract W-7405-eng-48)
(UCRL-15162) Avail: NTIS HC A05/MF A01

Spatial anomalies of seasonal precipitation for the United States and southwestern Canada were reconstructed from 1602 through 1961 using dendrochronological and multivariate techniques on 65 arid-site tree-ring chronologies from western North America. Seasonal reconstructions were averaged to obtain mean annual precipitation values for six regions of importance to the Nuclear Regulatory Commission (NRC) Nuclear Waste Management Program (NWMP). Statistics calculated from the regionally averaged annual values for 25 year and longer intervals show annual precipitation in the seventeenth through nineteenth centuries to be lower than in the twentieth century for three regions in the American Southwest and higher for one region in the Northwest and two regions in the East. The variability of precipitation generally was higher in the past three centuries than in the present century. Twenty-five-year intervals with noteworthy statistics are identified and important results are summarized. DOE

N80-28006# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
THE PRECIPITATION ENHANCEMENT PROJECT (PEP)
Dieter Paffrath Sep. 1979 88 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-642)
(DFVLR-Mitt-79-12; ESA-TT-642) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 15.30

The following workshop discussion topics are described: physics of clouds and predipitation, theories of weather modification, aircraft measuring systems, application of weather radar, microphysical measurements, condensation and ice nuclei, cloud seeding technology, hail suppression, and fog dispersal.
Author (ESA)

N80-28007# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.
CASE STUDIES OF CONVECTIVE STORMS. CASE STUDY 4: FIRST ECHOE CASE, 27 JULY 1976
Daniel W. Breed Nov. 1979 71 p refs
(Grant NSF ATM-77-23757)
(PB80-143233; NCAR/TN-147) Avail: NTIS HC A04/MF A01 CSCL 04B

On 27 July 1976, a relatively small, weak storm was investigated by the NCAR/NOAA instrumented sailplane in coordination with NCAR Queen Air 306D. The potential instability was weak on this day, and the investigated storm probably was initiated, from the observed surface convergence which resulted from outflow of an older storm to the northwest and/or surface topography. The sailplane made an extended penetration from 1635 to 1715 covering about 3400 m in altitude with weak updrafts initially, growing to moderately strong updrafts and then finally weak downdrafts. Ice particle concentration and size both increased throughout the penetration about 100/1 and 2-4 mm graupel. The Queen Air measured fairly weak updrafts at cloud base and mixed thermodynamic conditions. Later subcloud passes (about 1700) revealed theta(e) values. The storm had the characteristic life cycle of a simple rainshower. GRA

N80-28008# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.
CASE STUDIES ON CONVECTIVE STORMS. CASE STUDY 5: FIRST ECHO CASE, 12 JULY 1978
Steven M. Hunter and Charles A. Knight Jan. 1980 52 p refs
(Grant NSF ATM-77-23757)
(PB80-143241; NCAR/TN-150) Avail: NTIS HC A04/MF A01 CSCL 04B

A small, isolated, short lived cumulus congestus was studied using primarily a 10 cm radar, a cloud penetration with an instrumented sailplane, and time lapse photography from an aircraft some 40 km distant. The radar data reveal a conventional reflectivity history for the northeast Colorado region. The sailplane penetration shows updraft until the reflectivity maximum was reached, then downdraft, and that the precipitation formation was through the ice process primarily. The photography indicates that the cloud top attained -20 C nearly fifteen minutes before the first 5 dBZ echo, which occurred nearly simultaneously throughout a vertical zone from -10 to -30 C. GRA

N80-28009# Texas Dept. of Water Resources, Austin. Weather Modification and Technology Section.
TEXAS HIPLEX INTERIM PROGRESS REPORT Interim Progress Report, 1 Apr. - 30 Sep. 1979
10 Oct. 1979 141 p refs Sponsored in part by Bureau of Reclamation
(Contract DI-14-06-D-7587)
(PB80-133101; TDWR/LP-110) Avail: NTIS HC A07/MF A01 CSCL 04B

Progres in mesoscale data evaluation, development of ssynoptic climatology, analysis of satellite radiance data, radar data analyses and interpretation, and operational cloud-sampling and seeding activities is reported. Analysis of the 1978 mesoscale data indicates findings similar to those of 1976-77 data. Moisture appears to be the primary parameter for establishing a suitable cloud-seeding environment for the Texas HIPLEX area 1978 satellite imagery and radiance data are currently being analyzed and will be combined with 1976-77 data for a comprehensive analysis. Digitized M-33 (Snyder) radar tapes from 1976-78 are being reduced and analyzed. GRA

N80-28010# Texas Dept. of Water Resources, Austin.
TEXAS HIPLEX, 1979: FIELD OPERATIONS SUMMARY
William O. Alexander and Robert F. Riggio Nov. 1979 351 p

Sponsored in part by Bureau of Reclamation
(Contract DI-14-06-D-7587)
(PB80-134471; TDWR/LP-112) Avail: NTIS HC A16/MF A01 CSCL 04B

Daily events pertaining to the 1979 HIPLEX Field Program are summarized. Weather conditions, aircraft observations, and equipment status are described. A tabular summary of the operations is included, as well as rawinsonde and precipitation data tables. GRA

N80-26011# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data and Information Service.
MARINERS WEATHER LOG, VOLUME 23, NO. 6
Elwyn E. Wilson Nov. 1979 79 p refs
(PB80-145113; NOAA-79122607; ISSN-0025-3367) Avail: NTIS CSCL 04B

In addition to its regular sections, this issue contains the following articles: a frequent visitor to Lake Erie; buoy adrift from Station 41001; and Great Lakes ice season, 1978-1979. GRA

N80-26012# Washington State Univ., Pullman.
SYNOPTIC METEOROLOGY AND AIR QUALITY PATTERNS IN THE ST. LOUIS RAPS PROGRAM Final Report, May 1977 - Oct. 1979
Elmer Robinson and Richard J. Boyle Jan. 1980 98 p refs
(Grant EPA-805142)
(PB80-148299; EPA-600/4-80-001) Avail: NTIS HC A05/MF A01 CSCL 04B

An objective statistical synoptic weather map classification scheme developed to stratify map patterns for further study was used to type regional weather patterns. The investigation extended over a 500 mile radius of the greater St. Louis area was intended for subsequent application to air pollution studies. This analysis correlated sea level pressure data at 21 selected National Weather Service stations at a specified time on a given day, with sea level pressures for these same stations on each of the other days in the four year period 1973 through 1976. To illustrate the potential usefulness of this method to air quality and synoptic weather relationships, a preliminary comparison of the weather typing system to suspended particles and carbon monoxide concentrations was also made. GRA

N80-26013# Texas A&M Univ., College Station. Dept. of Meteorology.
MODELS OF ATMOSPHERIC WATER VAPOR BUDGET FOR THE TEXAS HIPLEX AREA
Steven F. Williams and James R. Scoggins Dec. 1979 66 p refs Prepared for Texas Dept. of Water Resources
(Contract DI-14-06-D-7587)
(PB80-147986; TDWR/LP-117) Avail: NTIS HC A04/MF A01 CSCL 04B

Water budget models developed for the Texas HIPLEX area for convective and non-convective conditions, as a function of echo height, areal coverage, and type (isolated cells, clusters of cells, and lines of cells) of convective activity are described. Intra and inter-comparisons of the water budget models indicate that greater amounts of water vapor are processed by increased depth and areal coverage of convective activity. An increased transport of water vapor near the surface is shown to be an important factor for increased convective activity. A 'storage' of water vapor aloft was observed to correlate with cases of increased precipitation. The net horizontal transport of water vapor exceeds other terms in the equation as being the primary moisture source for all cases of convection. GRA

N80-26014# National Oceanic and Atmospheric Administration, Seattle, Wash.
A REGIONAL SURFACE WIND MODEL FOR MOUNTAINOUS COASTAL AREAS
James E. Overland, Matthew h. Mitchman, and Young June Han Jun. 1979 41 p refs
(PB80-146152; NOAA-TR-ERL-407; PMEL-32; NOAA-79122602) Avail: NTIS HC A03/MF A01 CSCL 04B

A mesoscale numerical model of the planetary boundary layer (PBL) was modified for application to mountainous regions along the northwestern coast of the contiguous United States and the southern coast of Alaska. The model treats the PBL as a one layer primitive equation system solving for boundary layer height, potential temperature, and the two components of horizontal velocity. Input parameters are the large scale geostrophic wind pattern and the stability of the air mass. Experiments with a cross-section version of the model were performed to assess its response to variable terrain, differential roughness at the coast for a domain containing both a flat coastal plain and low coastal mountains. The complete model was applied to three quite dissimilar meteorological situations for the Puget Sound/Strait of Jaun de Fuca system in northwestern Washington state. GRA

N80-26015# National Environmental Satellite Service, Washington, D. C.
ENVIRONMENTAL SATELLITE IMAGERY
May 1979 100 p refs
(PB80-153356; NOAA-80021221) Avail: NTIS HC A05/MF A01 CSCL 04B

Current cloud data obtained by NOAA's operational environmental satellites is described. Daily global satellite imagery in condensed form is presented as a guide to data stored in the NOAA archive, and is designed to assist users in selecting data for research and climatological use. GRA

N80-26016# National Center for Atmospheric Research, Boulder, Colo.
INTERNAL STORM MOTIONS FROM A SINGLE NON-DOPPLER WEATHER RADAR
Ronald E. Rinehart Oct. 1979 278 p refs
(Grant NSF ATM-77-23757)
(PB80-143068; NCAR/TN-148) Avail: NTIS HC A13/MF A01 CSCL 04B

A correlation analysis pattern recognition technique called TREC (tracking radar echoes by correlation) is developed which is capable of determining motions within storms. The limitations and capabilities of TREC were explored using two approaches. First, the properties of real radar echoes (reflectivities, reflectivity gradients, and temporal and spatial decorrelations) were studied for their effect on the results of TREC. Second, flow fields and reflectivity fields were modeled. The success of TREC depends upon the interrelationships between the flow and reflectivity field characteristics as well as the parameters of TREC processing. A comparison of TREC results with data from a triple Doppler radar system showed that TREC vectors are apparently often generated either above or below the level being examined. GRA

N80-26017# National Center for Atmospheric Research, Boulder, Colo.
LIQUID WATER MEASUREMENTS IN HIGH ELEVATION CONTINENTAL CUMULI M.S. Thesis
Daniel W. Breed 14 Dec. 1979 116 p refs Prepared in cooperation with Colorado State Univ., Fort Collins
(Grant NSF ATM-77-23757)
(PB80-143928; NCAR/CT-57) Avail: NTIS HC A06/MF A01 CSCL 04B

Measurements of cloud droplet spectra, liquid water content, vertical velocity, and state parameters, were obtained by the NCAR/NOAA sailplane and two powered aircraft. A relatively high droplet concentration of about 600/cu m, a narrow droplet distribution with a mean volume diameter of 7.6 micrometers, and liquid water contents of 0.5-1.0 g/cu m are characteristic of these high elevation cumuli. These continental characteristics and the lack of large droplets suggest that droplet coalescence is not a significant precipitation formation process, while observations of graupel particles and other ice forms show that accretional growth of ice particles is common. The measurements from the different aircraft and instruments are compared. GRA

N80-26018# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Quality Div.
ISENTROPIC TRAJECTORIES FOR DERIVATION OF OBJECTIVELY ANALYZED METEOROLOGICAL PARAMETERS
Philip Haagenson and Melvin A. Shapiro Dec. 1979 40 p refs
(Grant NSF ATM-77-23757)
(PB80-143118; NCAR/TN-149) Avail: NTIS

HC A03/MF A01 CSCL 04B

A numerical technique for calculating isentropic trajectories, and the objective analysis of trajectory derived meteorological parameters are presented. A brief historical summary of the isentropic trajectory concept and objective analysis method is presented. The requirement for large numbers of trajectories on a global scale necessitated development of an objective computer program. A brief case study illustrating the objective analysis of trajectory derived meteorological parameters is included. GRA

N80-26019# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

SATELLITE CLOUD CLIMATOLOGICAL RESULTS, 1978: COMPARISON TO 1976-77

David W. Reynolds and Richard W. Stodt Dec. 1979 42 p refs

(Contract DI-9-07-85-V00025)

(PB80-148117) Avail: NTIS HC A03/MF A01 CSCL 04B

Cloud statistics obtained from digital visible and infrared satellite data collected in support on HIPLEX for 1978 are summarized. Results of these cloud statistics are compared with previous results obtained for 1976 and 1977. Results from these comparisons show that: (1) cloud size distributions change little from year to year and from the Miles City region to the Goodland region; (2) the number of clouds within each target area shows a general trend upward for the past three years; (3) the timing and location of cloud development changes drastically from year to year for both locations; (4) separation of clouds of varying size appears to represent a rather well defined distribution for both Miles City and Goodland; and (5) stratification of a day's convective activity can be performed using satellite IR data.

J.M.S.

N80-26020# National Technical Information Service, Springfield, Va.

HURRICANES FORECASTING, MODIFICATION, AND RESEARCH. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jan. 1980

Edward J. Lehmann and Robena J. Brown Feb. 1980 283 p Supersedes NTIS/PS-79/0018; NTIS/PS-78/0028; NTIS/PS-77/0026

(PB80-804255; NTIS/PS-79/0018; NTIS/PS-78/0028; NTIS/PS-77/0026) Avail: NTIS HC $30.00/MF $30.00 CSCL 04B

Presented are citations to research reports covering hurricane modeling, cloud seeding, remote sensing, air water interactions, heat transfer, and wind motion. This updated bibliography contains 278 abstracts, 11 of which are new entries to the previous edition. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N80-26021 Hawaii Univ., Honolulu.

GEOLOGICAL AND GEOTECHNICAL INVESTIGATION OF SEDIMENT REDISTRIBUTION ON THE CENTRAL EQUATORIAL PACIFIC SEAFLOOR Ph.D. Thesis

James Dennis Craig 1979 267 p

Avail: Univ. Microfilms Order No. 8012252

Examination of data shows that erosion rates during intensified circulation episodes in Eocene/Oligocene and middle Miocene time range from 10 to 30 meters/million years (m/my). The data suggest that erosion and redistribution are primarily influenced by local factors such as bathymetric relief, tectonic history or the frequency and lateral extent of erosive bottom currents. In two localities studied, the majority of sediment redistribution occurred prior to late Miocene time and involved approximately 25 to 50 m of material. This could be accomplished either by a relatively continuous process at rates of m/my or by active erosion during the middle Miocene episode. The majority of sediment cores collected in all bathymetric settings have a low strength surface layer to depths of about 10 cm produced by bioturbation. Because these sediments have high shear strengths, biotrubation may regulate erosion over geologic time. It is postulated that erosion of the seafloor occurs at current speeds greater than about 20 cm/s, and that this process rapidly scours the upper 1 to 2 cm across wide areas. Dense concentrations of suspended material tend to dampen near bottom turbulence causing erosion and vertical mixing, and these turbid layers transport material down slopes into local basins. Dissert. Abstr.

N80-26022 Wisconsin Univ. - Madison.

THE CLIMATIC IMPACT OF SEA SURFACE TEMPERATURE ANOMALIES ON ZONALLY SYMMETRIC AND ASYMMETRIC FLOWS: A QUASI-GEOSTROPHIC MODELING APPROACH Ph.D. Thesis

Thomas Joseph Phillips 1979 190 p

Avail: Univ. Microfilms Order No. 8007568

Some aspects of ocean atmosphere interaction were clarified by making use of a nonlinear model with simplified physics. Climatic mean and transient responses of zonally symmetric and zonally asymmetric atmospheric flows to smaller scale sea surface temperature anomalies were investigated. In cases of zonally asymmetric flows the climatic impact of longitudinal shifts in the position of these anomalies was studied. Climate effects of variations of vertical wind shear and static stability were also examined. The nonlinear simulations were compared with steady state linearized solutions as well as with results of selected general circulation model experiments. Dissert. Abstr.

N80-26023*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.

GEOS-3 RADAR ALTIMETER STUDY FOR THE SOUTH ATLANTIC BIGHT

C. D. Leitao, N.E. Huang, C. L. Parsons, C. G. Parra (EG and G Washington Analytical Services Center), J. D. McMill (EG and G Washington Analytical Services Center), and G. S. Hayes (Applied Sci. Associates, Inc.) May 1980 144 p refs

(Contract DI-AA551-IA8-39)

(NASA-TM-73286) Avail: NTIS HC A07/MF A01 CSCL 08C

Three years of radar altimeter data from GEOS-3 for the South Atlantic Bight were processed. Mean monthly topographic maps were produced which estimate geostrophic flow in the region. Statistical distribution of the surface wind speed and significant wave height as a function of both space and time are presented. R.E.S.

N80-26024# Miami Univ., Coral Gables, Fla.

COASTAL UPSWELLING ECOSYSTEMS ANALYSIS. PHYSICAL DYNAMICS OF THE COASTAL UPWELLING FRONTAL ZONE OFF OREGON Ph.D. Thesis

Thomas Brian Curtin Sep. 1979 336 p refs Prepared for NSF

(PB80-139843; NSF/IDOE/CUEA/TR-59; NSF/IDOE-79-127) Avail: NTIS HC A15/MF A01 CSCL 08C

The transient (wind-driven), coastal upwelling frontal zone off Oregon is described in terms of the main kinematic and hydrographic scales, geostrophy, potential vorticity, cross-shelf circulation and mixing. Along-shelf flow is in geostrophic balance in the interior one third of the water column over the shelf, with a tendency for the geostrophic shear to exceed the observed shear inshore of the frontal zone above 40 m. During spin-down, the surface density front moves shoreward and intensifies; the interior density front remains stationary at mid-shelf and weakens. Transport is shore-ward in the upper 2/3 of the water column, and seaward in the layer near the bottom. The structures of the water mass front, chlorophyll distributions, and horizontal velocity fields suggest a recirculation cell occurs in-shore of the interior density front. The frontal zone is most two dimensional during intervals of sustained upwelling or downwelling favorable winds exceeding a minimum magnitude. During times of slack winds or wind reversals, the frontal zone is inherently three dimensional. GRA

N80-26025# Woods Hole Oceanographic Institution, Mass.

NEW ENGLAND SHELF/SLOPE EXPERIMENT. DATA REPORT: THE MOORED ARRAY Technical Progress Report, Feb. - Aug. 1978

Hsien Wang Ou, John A. Vermersch, Wendell S. Brown (New Hampshire Univ.), and Robert C. Beardsley Jan. 1980 59 p refs

(Grants NSF OCE-76-01813; NSF OCE-78-19513)
(PB80-151640; WHOI-80-3) Avail: NTIS HC A04/MF A01 CSCL 08C

The kinematic and dynamic coupling of the low frequency oceanic motions between the outer New England shelf and the deeper slope/rise regions was studied. The current, temperature, and bottom pressure fluctuations across the New England continental margin were monitored simultaneously. Results are presented. GRA

N80-26028# Woods Hole Oceanographic Institution, Mass.
THE APPLICATION OF INVERSE METHODS TO PROBLEMS IN OCEAN CIRCULATION Ph.D. Thesis
Dean Howard Roemmich Jan. 1980 197 p refs
(Grants NSF OCE-76-80210; NSF OCE-79-19833)
(PB80-149651; WHOI-80-6) Copyright. Avail: NTIS HC A09/MF A01 CSCL 08C

The inverse method of estimating ocean circulation form hydrographic data is examined with particular attention to the problem of scale resolution. The method applies conservation constraints in a number of distinct layers separated by surfaces of constant potential density. These constraints are used to find a geostrophic flow field which is the product of a known linear resolution operator on the hydrographic station grid scale field of absolute velocity. Two simple hypothetical examples are analyzed in detail in order to illustrate why some features can be anticipated and identified in real problems. Three applications of the method are presented, using historical hydrographic data from the Atlantic Ocean. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N80-26027 Oregon State Univ., Corvallis.
VARIATIONS IN PHYTOPLANKTON PHYSIOLOGICAL PARAMETERS DURING TRANSIENT NITROGEN ENVIRONMENTS Ph.D. Thesis
John Michael Demanche 1980 121 p
Avail: Univ. Microfilms Order No. 8013666

The relationship among nitrogen uptake, assimilation and phytoplankton growth during changing or transient nitrogen environments was investigated. A new culture system, diffusion culture, was developed to provide realistic low nitrogen environments. Physiological parameters for two species of diatom, Skeletonema costatum and Thalassiosira aestivalis were determined for a variety of nitrogen regimes, progressing from non-nitrogen limited, two nitrogen adapted, and to nitrogen starved cultures. Additions of nitrate, or nitrate and ammonium, were made to each regime; uptake rate, assimilation rate, and changes in cell physiological parameters were measured. Internal pools of nitrate, ammonium, and total free amino acids were measured and related to both conditioning regime and nitrogen perturbation. Two mechanisms for nitrate reduction were found, one that is coupled to nitrate uptake and another independent of uptake. The rate of nitrate reduction was not solely a function of internal concentration. Ammonium inhibited nitrate uptake, but the inhibition could not be explained by changes in intracellular ammonium or free amino acids. A conceptual model of nitrate uptake for transient environments was developed. Dissert. Abstr.

N80-26028 Washington Univ., Seattle.
PHYTOPLANKTON PRIMARY PRODUCTION BELOW ARCTIC OCEAN PACK ICE: AN ECOSYSTEMS ANALYSIS Ph.D. Thesis
Clarence Greer Pautzke 1979 191 p
Avail: Univ. Microfilms Order No. 8013580

Chlorophyll, primary production, zooplankton, water temperature, salinity, nutrients, solar radiation, surface melt, air temperature, wind speed, and island movement were observed in the Canada Basin at T-3 from 1969 to 1973 and in the Beaufort Sea at AIDJEX in 1975. Primary production in the Arctic Ocean was then quantitatively related to the physical, chemical and biological components of the ecosystem. Submarine light and primary production were modelled using observed incident radiation, surface conditions, a theoretical photosynthesis-light relation and chlorophyll a distribution. Production was highest in July and August. Annual production was 2 to 6 g C/sq m. Calanus hyperboreus and glacialis, Microcalanus pygmaeus, and Oithona similis dominated the zooplankton. Each developed one brood in summer at AIDJEX. Zooplankton dry weight above 100 m was highest in summer and lowest in spring. Herbivores required 25 to 30% of the primary production in July and August for respiration, brood development, and food storage for overwintering. Dissert. Abstr.

N80-26029# Royal Aircraft Establishment, Farnborough (England).
CHANCES OF DETECTING AND DIFFERENTIATING CENTRAL SYSTEM EFFECTS OF DRUGS IN ANIMAL EXPERIMENTS WITH SPECIAL CONSIDERATION OF BEHAVIOURAL PHARMACOLOGICAL METHODS
F. Hoffmeister and W. Wuttke Nov. 1979 44 p refs Transl. into ENGLISH from Arzneim. Forsch. (West Germany), v. 25, no. 7A, 1975 p 1162-1178
(RAE-Lib-Trans-2034; BR73312) Avail: NTIS HC A03/MF A01

Animal experimental methods suitable for the assessment of actions of drugs of the central nervous system are described with special reference to behavioral actions. The value of those methods for the prediction of central nervous actions of drugs in man are discussed. R.C.T.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N80-26030 Tennessee Univ., Knoxville.
THE RELATIONSHIP OF EXERCISE PERFORMANCE TO VARIATIONS IN BLOOD ACID-BASE STATUS INDUCED BY CHANGES IN THE INSPIRED OXYGEN FRACTION Ph.D. Thesis
Richard Paul Adams 1979 135 p
Avail: Univ. Microfilms Order No. 8012441

Possible limiting factors in human exercise performance were investigated. Six subjects rode a bicycle ergometer on three different occasions breathing either a 17 percent, 21 percent, or 60 percent oxygen mixture. In addition to rest and recovery periods, each subject worked for 10 minutes at 55 percent of maximal oxygen uptake and then to exhaustion at about 91 percent of maximal oxygen uptake. The values measured included performance time, inspired and expired gas fractions, minute ventilation heart rate, and 'arterialized' venous PO2, PCO2, and pH Oxygen uptake, carbon dioxide output, respiratory exchange ratio, [H (+)], and [HCO3 (-)] were calculated. The results indicated that performance times were longer in hyperoxia than in normoxia or hypoxia. However, contrary to other published literature, oxygen uptake was not different at exhaustion in normoxia as compared to hypoxia (p greater than .1) or hyperoxia (p = .09). Also, during exercise the higher inspired oxygen fractions were generally associated with decreased HLa and increased [H (+)], PCO2, and [HCO3 (-)]. However, at exhaustion [H (+)] was not different under any inspired oxygen fraction (p = .8). Dissert. Abstr.

N80-26031 Louisiana State Univ. and A&M Coll., Baton Rouge.
MEASUREMENT OF THE MECHANICAL IMPEDANCE OF HUMAN SOFT TISSUE IN VIVO Ph.D. Thesis
Hany Mohamed Gamal-Eldin Hussein 1979 111 p
Avail: Univ. Microfilms Order No. 8013122

A test system was developed for the measurement of point impedance of human soft tissue in vivo at various frequencies and static preloads. Impedance data were analyzed utilizing a viscoelastic solid model. Phase angle measurements were utilized to separate the resistive and reactive components of the complex impedance. The tissue was excited by a swept sinusoidal forcing function at a constant RMS velocity. The relative contribution of the energy storage and dissipation functions to the tissue impedance is shown to be frequency dependent. Within the range of preloads employed in this study, it is shown that the dynamic stiffness of the tissue continues to rise with increasing

preloads while the viscous damping coefficient increases with increasing preloads only up to an intermediate preload beyond which the damping coefficient is almost independent of preload. Dissert. Abstr.

N80-26032* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY. A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 207
Jun. 1980 65 p
(NASA-SP-7011(207)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 184 reports, articles, and other documents introduced into the NASA scientific and technical information system in May 1980. Author

N80-26033# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
USING REPRESENTATIVE KNOWLEDGE TO GUIDE DECISION MAKING IN AUTOMATIC DIAGNOSTIC SYSTEMS [EXTENSOES DA REPRESENTACAO DE CONHECIMENTO ATRAVES DE REGRAS DE DECISAO EM SISTEMAS DE DIAGNOSTICO AUTOMATICO]
Alfonso deLigorio Faria and Paulo Ouvera Simoni Mar. 1980 19 p refs In PORTUGUESE; ENGLISH summary Presented at the 6th Congr. Brasileiro de Engenharia Biomedica, 24-27 Oct. 1979 Revised
(INPE-1686-RPE/117-Rev) Avail: NTIS HC A02/MF A01

Many automatic medical diagnostic systems use artificial intelligence techniques for the representation and application of knowledge in order to get an approximation for the medical reasoning in the diagnostic process. It was observed that one limitation of these systems is the lack of flexibility in the representation of knowledge. A new representation for knowledge is proposed in the form of decision rules by conditional fuzzy propositions. Through this method the truth values of an attribute can be represented as well as possibility distributions over the universes. A uniform rule evaluation and evidence combinations are also attained. A set of rules for the diagnostic of the urinary tract infection of children was written, for which the proposed technique was applied. Author

N80-26034# SRI International Corp., Menlo Park, Calif.
MAMMALIAN TOXICOLOGICAL EVALUATION OF TNT WASTEWATERS. VOLUME 2: ACUTE AND SUBACUTE MAMMALIAN TOXICITY OF TNT AND LAP MIXTURE Final Report, Apr. 1976 - Sep. 1978
James V. Dilley, Charles A. Tyson, and Gordon W. Newell Jun. 1979 519 p refs
(Contract DAMD17-76-C-6050; DA Proj. 3E1-62720-A-835) (AD-A080957; LSU-5028) Avail: NTIS HC A22/MF A01 CSCL 06/20

The acute toxicity of TNT, RDX, LAP (1.6 TNT/1.0 RDX), and/or LAP(I) (photolyzed LAP: 0.032 TNT/1.0 RDX, 10% undegraded RDX) was determined in mammalian species. In male and female rats, respectively, the acute oral LD50s were: TNT, 1320 and 794 mg/kg; RDX, 71 and about 70 mg/kg; and LAP, 574 and 594 mg/kg or lower, depending on particle size. In male and female mice, respectively, the LD50s were: TNT, 660 mg/kg (both sexes); RDX, 75 and 86 mg/kg; and LAP947 and 1131 mg/kg. LAP(I) was examined in mice only; the acute oral LD50s in males and females were: 585 and 684 mg/kg, respectively. LAP and LAP(I) produced conjunctivitis, iritis, and/or corneal opacity in rabbit eyes; the irritation was not totally reversed in unwashed eyes after 7 days and longer. In in vitro microbial assays using microsomal activation (Ames Test), TNT was mutagenic. LAP was also mutagenic, and photolysis increased its mutagenicity. In contrast, in vivo cytogenetics studies on rat bone marrow extracts failed to detect an effect of either TNT or LAP on somatic cells. The effects of repeated oral administration of TNT and of LAP were determined in 90 day studies in dogs, rats, and mice. Observations common to the three species treated with either test material were depressed body weight and/or weight gain and food intake, mild to moderate hemolytic anemia, enlarged spleens and (usually) livers, hemosiderosis of the spleen and colored urine. GRA

N80-26035# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Aerospace Medical Div.
VARIOUS TECHNIQUES FOR EVALUATING CARDIODYNAMIC FUNCTION USING CHRONICALLY INSTRUMENTED CANINE MODELS
Kenneth C. Back and E. W. VanStee (National Inst. of Environmental Health Sciences, Research Triangle Park, N.C.) 1979 13 p refs Repr. from pharmac. Ther., V. 5, 1979 p 103-113 presented at Intern. Workshop on Pharmacol. Methods in Preclinical Safety Evaluation of New Drugs
(AF Proj. 6302)
(AD-A071264; AMRL-TR-78-119) Avail: NTIS HC A02/MF A01 CSCL 06/16

The pharmacological consequences of the initiation of low-molecular weight hydrocarbonated alkanes used in fire extinguishers were studied. A novel method for the determination of the maximum rate of ventricular pressure change or peak divided by the developed pressure. An application of the method to the evaluation of the isotropic effect of CBrF3 is described. R.E.S.

N80-26036# Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Clinical Research Div.
DEVELOPMENT OF AN AUTOMATED STRESS/DURESS DETECTION SYSTEM, PHASE 1 AND PHASE 2 Summary Report
Waneta C. Tuttle, Jerry G. Davis, E. R. Greene, and Jack A. Loeppky Sandia Labs. Dec. 1979 13 p refs
(Contracts EY-76-C-04-0789; DE-AC04-76DP-00789)
(SAND-79-7038) Avail: NTIS HC A02/MF A01

Remote analysis of heart rate was investigated and was found to have potential as an effective means of automatic detection of stress in guards. The analysis of the data suggests that a heart rate greater than either CHR (criterion heart rate) + 20% (as established in the exercise test) or 150 beats per minute is the best criterion for initial establishment of alarm criteria. DOE

N80-26037# Analytic Sciences Corp., Reading, Mass.
USER'S MANUAL FOR BIOSPHERE AND DOSE SIMULATION PROGRAM (BIODOSE)
John J. Duffy and Gary P. Bogar 4 Jan. 1980 72 p refs
(Contract W-7405-eng-26)
(UCRL-15188) Avail: NTIS HC A04/MF A01

The BIOsphere Transport and DOSE program (BIODOSE) is described. BIODOSE simulates the transport of radionuclides in surface systems and the resulting concentration of nuclides in the food chain. It includes the prediction of human dosage risks for individuals and for populations resulting from release of radionuclides into surface water or well water. The BIODOSE program was designed for easy use, including standard defaults and a flexible input scheme. DOE

N80-26038# Argonne National Lab., Ill.
INNATE AND GENETIC NATURE OF CIRCADIAN RHYTHMS
Charles F. Ehret 1979 19 p refs Sponsored in part by NATO
(Contract W-31-109-eng-38)
(DOE/TIC-11132) Avail: NTIS HC A02/MF A01

Circadian cybernetics which deal with biological time constants in the temporal range from minutes to days is discussed. The mode rules, the period rules, and the phase rules are examined. The inmate and phylogenetically ubiquitous nature of circadian oscillations is comprehended, along with responses to a wide variety of environmental stimuli. DOE

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

No abstracts in this category.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N80-28039*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HEAD-UP TRANSITION BEHAVIOR OF PILOTS DURING SIMULATED LOW-VISIBILITY APPROACHES
Richard F. Haines Jun. 1980 35 p refs
(NASA-TP-1618; A-8057) Avail: NTIS HC A03/MF A01 CSCL 05H

Each of 13 commercial pilots from four airlines flew a total of 108 manual flight director approaches in a moving base simulation of a medium-sized turbojet (95,000 lb gross weight) which had a day and night Redifon external scene. Three levels of runway visual range (RVR) (1,600; 2,400; and greater than 8,000 ft), three wind-shear profiles, nine ceiling heights, and continuous and intermittent visibility after initial breakout were tested. The results indicated that: (1) mean decision time ranged from 2 to 4.6 sec for ceilings under 380 ft across the three RVR conditions; (2) mean vertical distance traveled during the visual-cue assessment period was a relatively constant proportion below the existing ceiling; (3) a significant three way interaction in mean decision time between wind shear, day-night, and ceiling RVR variables occurred; (4) mean number of head-up transitions to VFR conditions after breakout ranged from 4.6 to 13.4 and increased as a function of ceiling and severity of wind shear; the typical duration of fixation out the window was 1.5 sec; and (5) subjective pilot ratings of controllability and precision of control as well as amount of skill, attention, or effort required to make the landing were influenced significantly by the wind shear, night conditions, and low breakout ceiling conditions. R.E.S.

N80-28040*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLIGHT-DECK AUTOMATION: PROMISES AND PROBLEMS
Earl L. Wiener (Miami Univ., Coral Gables, Fla.) and Renwick E. Curry Jun. 1980 27 p refs
(NASA-TM-81206; A-8210) Avail: NTIS HC A03/MF A01 CSCL 05H

The state of the art in human factors in flight-deck automation is presented. A number of critical problem areas are identified and broad design guidelines are offered. Automation-related aircraft accidents and incidents are discussed as examples of human factors problems in automated flight. R.E.S.

N80-28041# Eikonix Corp., Burlington, Mass.
TECHNOLOGY ASSESSMENT: THE IMPACT OF ROBOTS Final Report
Sep. 1979 261 p refs
(Grant NSF ESR-76-00637)
(PB80-142268; EC/2405801-FR-1; NSF/PRA-7600637) Avail: NTIS HC A12/MF A01 CSCL 06D

Intended to provide a data base for the development of policy options regarding the diffusion of robotics, the study is divided into four phases: surveying and forecasting relevant technology for the development of robots through 1990; examining possible application areas for technological feasibility and significance of impact resulting in the selection of major areas of application; investigating potential socio-economic ramifications of each of the selected application areas; and elucidating policy alternatives influencing robotics development. The study concluded that diffusion of robotics in the application areas selected at a rapid rate is highly unlikely. The technical constraints against a vast change in the scope of robotic capabilities is one reason for the slow diffusion rate. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N80-28042 Clarkson Coll. of Technology, Potsdam, N.Y.
MICROPROCESSOR SELF-DIAGNOSIS Ph.D. Thesis
Ulhas Venkatesh Gumaste 1980 155 p
Avail: Univ. Microfilms Order No. 8013657

An algorithm for microprocessor self fault detection concurrent with the program under execution is presented. This algorithm is shown to complete testing concurrently with any program under execution if the program is executed for sufficient length of time. A hardware design for self-fault detection using the suggested algorithm is also presented. The suggested design is economical since (1) it does not increase the hardware on the chip significantly, and (2) it does not increase the pin count of the chip. Also, an evaluation of the suggested self-testing architecture for an Intel 8080 type processor is presented. The results of this evaluation show that the testing of this microprocessor can be completed concurrently along with the entering and listing, and with the execution of a sample program in a very short time. Dissert. Abstr.

N80-28043 Rutgers - The State Univ., New Brunswick, N. J.
A MICROPROGRAMMABLE DIGITAL SIGNAL PROCESSOR: CONCEPTION, DESIGN, APPLICATION Ph.D. Thesis
John Hartung 1980 198 p
Avail: Univ. Microfilms Order No. 8013160

A microprogrammable digital signal processor structure (PSP) which efficiently implements both the classical and the new sequentially computed algorithms. The design is based on the modular logic machine design methodology and provides a structure which can be optimized with respect to functional units. Programs for the PSP are written in a microassembly language which is translated by an assembler running on the host computer. Experiments were run on the PSP to compare the performance of the cascade and UL filter algorithms. Both algorithms were implemented in the microassembly language of the PSP and achieved comparable bandwidths as measured by the number of microinstructions required to implement an elemental section. Dissert. Abstr.

N80-28044 Maryland Univ., College Park.
READ ONLY MEMORY OPTIMIZATION FOR MICROPROGRAMMED DIGITAL COMPUTERS Ph.D. Thesis
Bor-Ren Albert Jeng 1979 159 p
Avail: Univ. Microfilms Order No. 8012659

The optimization of read only memory (ROM) digit dimension for microprogrammed digital computers is considered. Given a

microprogram specification for a particular application, the designer is faced with the problem of encoding selected microoperations into groups in order to reduce the width of control memory words. A new efficient algorithm for grouping microoperations to reduce the width of control memory words is developed and analyzed here. This algorithm significantly extends and formalizes previous work for finding minimal group solutions by exploiting the intrinsic properties of compatibility relations among the microoperations without first finding the set of maximum compatibility classes. The power and practicality of this algorithm are demonstrated by evaluating its performance on all previously published ROM optimization examples, as well as, on large realistic problems taken from the microprogram specifications for two commercial digital computers. In every case this algorithm quickly produces the minimal group solution and near minimal dimension solution. Dissert. Abstr.

N80-26045*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW POWER NASA 36 BIT TIME CODE GENERATOR
David Langjahr Apr. 1980 16 p
(NASA-TM-80697) Avail: NTIS HC A02/MF A01 CSCL 09B

A 36 bit time code generator implemented in CMOS is described. A microprocessor is used to minimize chip count. A modified 20 second format is available as an option, by changing two program steps. Author

N80-26046# Wayne State Univ., Detroit, Mich.
MODELLING AND RESOURCE ALLOCATION OF LINEARLY RESTRICTED OPERATING SYSTEMS Final Technical Report, May 1978 - Jun. 1979
Tse-Yun Feng and C. P. Hsieh Griffiss AFB, N.Y. RADC Dec. 1979 157 p refs
(Contract F30602-76-C-0282; AF Proj. 5597)
(AD-A082363; RADC-TR-79-311) Avail: NTIS HC A08/MF A01 CSCL 09/2

Operating System is an integral part of a total computing utility. Its structure is complicated and the viewpoint on the subject is diversified. If the computing system is viewed upon as a collection of different resource types to serve different users with different demands, then the operating system assumes the managerial role. To best utilize the available resources to achieve a desirable level of production, i.e., computation, an optimal planning (programming) is needed. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N80-26047 Duke Univ., Durham, N. C.
ADAPTIVE MSE ESTIMATION ALGORITHMS Ph.D. Thesis
Steven Michael Sharpe 1979 154 p
Avail: Univ. Microfilms Order No. 8012053

A very important problem in communication theory is the estimation of a signal in the presence of additive noise. A common approach to this problem is to form, from a weighted linear combination of the data, an estimate of the signal which approximates the signal in some sense. If the usual criterion of minimum mean square error between signal and estimate is employed, and if the signal and noise statistics are known, the optimum set of weights may be determined in a straightforward manner, leading to the well-known Wiener-Hopf equation. Two approaches are carefully compared, both theoretically, and through computer simulations. In addition, a number of subtle points relating to one or both algorithms, which frequently confuse comparisons, have been clarified. These points include the role of the convergence parameter mu, the idea of decorrelation delay, and the importance of the initial weight vector used to start the stochastic algorithm. Justification is given for using a zero initial weight vector, and the parameter mu is shown to be related to the memory of the algorithm and consequently to control not only the convergence rate, but also the steady state performance of the algorithm, and its ability to adjust to changing statistical conditions. Approximate analytical expressions for the performance of both algorithms are derived, which are in close agreement with simulation results in the very important region of low signal to noise ratios. Dissert. Abstr.

N80-26048 Washington Univ., Seattle.
THE COMPLEXITY OF PARALLEL ALGORITHMS Ph.D. Thesis
Gary Lynn Peterson 1979 126 p
Avail: Univ. Microfilms Order No. 8013582

The complexity of problems in concurrent processing is analyzed. A formal model is presented with which the types of concurrent systems, the problems, and their complexity measures are expressed. The first problem analyzed is the critical section (mutual exclusion) problem in a simple distributed system with failures. Nearly tight upper and lower bounds were found, even when extra fairness conditions were imposed. A time analysis indicates that one algorithm in particular can be considered very efficient. The second problem is also the critical section problem, but in a system which allows test-and-set operations on shared variables. Again, remarkably tight space bounds are given. One algorithm is found to be optimal in time. The third major problem is to solve a version of the classic readers/writers problem, but where copying of the shared data is permitted. In all the versions of the problem studied, the number of copies that may have to be made is given exactly, i.e., both upper and lower bounds are equal. Solutions to the problem also answer the question of whether a distributed system with arbitrarily large shared variables is any more powerful than a system with only binary valued shared variables in the negative. The techniques developed to derive algorithms and lower bounds form the main contributions. Dissert. Abstr.

N80-26049 Washington Univ., Seattle.
SEQUENTIAL CONTROL STRUCTURE ABSTRACTIONS FOR PROGRAMMING LANGUAGES Ph.D. Thesis
Brian Thomas Lewis 1979 190 p
Avail: Univ. Microfilms Order No. 8013557

An exploration of sequential control abstractions is described. A control abstraction facility (CAF) is presented, which is intended to be incorporated in object oriented programming languages to support the introduction of new sequential control abstractions. Practicality of the CAF is demonstrated by its inclusion in a Pascal-based programming language, CAL, which has been implemented with a compiler-interpreter. Several examples of control abstraction definition and use in CAL are given, including the loop with exit, guarded command selector, and loop, coroutine system, linear sequential pipeline, and generator-based for loop control abstractions. Experiences with the use of CAL and its implementation are noted. Dissert. Abstr.

N80-26050 Wisconsin Univ. - Madison.
THE INDUCTION OF THE SYNTAX OF NATURAL LANGUAGE BY COMPUTER Ph.D. Thesis
Paul James Orgren 1979 120 p
Avail: Univ. Microfilms Order No. 8008832

A computer program, SYNNER, that attempts to learn an augmented transition network (ATN) grammar for English is described. The process being modelled is that of a human learner who already has some conceptual knowledge and a vocabulary relating to that knowledge. This learner observes a real-world event and hears a sentence describing that event, and then adjusts his rules of grammar, if necessary, to account for the new sentence. SYNNER's conceptual knowledge and vocabulary are predefined in terms of conceptual dependency (CD) theory, a representation based on a small number of primitives. To avoid the problems of perception, the real-world event is hand-coded into a CD structure, while the sentence is given as a string of words on an interactive computer terminal. The learning procedure begins by comparing the sentence to the event using its built-in knowledge of the vocabulary. This matching process determines the semantic role of each word in the sentence. A parse of the sentence is then attempted using the current ATN grammar. Dissert. Abstr.

N80-26051 Duke Univ., Durham, N. C.
PERFORMANCE COMPARISONS OF SEVERAL ADAPTIVE LEAST MEAN SQUARE ALGORITHMS Ph.D. Thesis

Rachel Messina Kinicki 1979 177 p
Avail: Univ. Microfilms Order No. 8012039

The estimation of a signal mixed with an additive noise process is an important problem in digital signal processing theory. The data available is in sampled form and it is desired to form an estimate of the signal to satisfy the chosen error criterion. When the minimum mean square error is the desired criterion and a causal, linear digital filter with finite unit sample response is utilized to form the signal estimate, the classical Wiener-Hopf solution results. This solution requires the data autocorrelation matrix and cross-correlation vector be known a priori and also involves the computation of a matrix inverse. Often, however, the data autocorrelation matrix and cross-correlation vector are unknown and as a result, many algorithms have been derived as an attempt to estimate the optimum Wiener-Hopf filter. One well known algorithm, the LMS (least mean square) algorithm based on the numerical method of steepest descent, was developed by Widrow at Standford in the 1950's. This algorithm requires choosing a convergence coefficient, mu, which greatly effects the convergence properties of the algorithm. The classical convergence proof of the LMS algorithm bounds the value of mu necessary for the mu convergence of the LMS weight vector to the Wiener-Hopf weight vector. This research shows that a tighter bound for mu is necessary for convergence due to an invalid assumption in the classical proof. Dissert. Abstr.

N80-26052 Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Automatique.

RESEARCH ON PARALLEL ESTIMATORS Final Report [RECHERCHE D'ESTIMATEURS A STRUCTURES PARALLELE]

Michel Gauvrit, Catherine Fargeon, and Pierre Rodrigo Dec. 1977 222 p refs In FRENCH
(Contract DGRST-76-7-0334)
(CERT-1/7125-DERA) Avail: Issuing Activity

An analysis is presented of the performance of parallel algorithms assuming: the state estimation of a linear stochastic system in an unknown noise environment, the state estimation of a linear system with unknown parameters (constant or time varying) the simultaneous estimation of state and parameters in an unknown noise environment. The importance of the convergence and the quality of the Bayes estimates is shown as well as the influence of passive control with state return. A parallel estimator has been implemented on a hardware system with eight microprocessors. Author (ESA)

N80-26053*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE RSZ BASIC PROGRAMMING LANGUAGE MANUAL

Raymond J. Stattel, James K. Niswander, and Avil K. Kochhar Jun. 1980 52 p refs
(NASA-TM-80690) Avail: NTIS HC A04/MF A01 CSCL 09B

The RSZ BASIC interactive language is described. The RSZ BASIC interpreter is resident in the Telemetry Data Processor, a system dedicated to the processing and displaying of PCM telemetry data. A series of working examples teaches the fundamentals of RSZ BASIC and shows how to construct, edit, and manage storage of programs. E.J.R.

N80-26054*# Wolf Research and Development Corp., Pocomoke City, Md.

ARC PROGRAM DOCUMENTATION

James D. McMillan Mar. 1976 52 p
(Contract NAS6-2639)
(NASA-CR-156867) Avail: NTIS HC A04/MF A01 CSCL 09B

A description of the input and output files and the data control cards for the altimeter residual computation (ARC) computer program is given. The program acts as the final altimeter preprocessor before the data is reformatted for external users. It calculates all parameters necessary for the computation of the altimeter observation residuals and the sea surface height. Mathematical models used for calculating tropospheric refraction, geoid height, tide height, ephemeris, and orbit geometry are described. M.G.

N80-26055*# Old Dominion Univ. Research Foundation, Norfolk, Va.

AN INVESTIGATION OF THE FEASIBILITY OF IMPROVING OCULOMETER DATA ANALYSIS THROUGH APPLICATION OF ADVANCED STATISTICAL TECHNIQUES Final Report, 1 Nov. 1978 - 31 Dec. 1979

Dharam S. Rana (Jackson State Univ., Miss.) Jun. 1980 36 p refs
(Grant NsG-1565)
(NASA-CR-163238) Avail: NTIS HC A03/MF A01 CSCL 09B

The data reduction capabilities of the current data reduction programs were assessed and a search for a more comprehensive system with higher data analytic capabilities was made. Results of the investigation are presented. E.J.R.

N80-26056*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

USER'S GUIDE FOR SKYLAB DYNAMICS PROGRAM, SKYDYN

M. S. Hopkins May 1980 73 p refs
(NASA-TM-78279) Avail: NTIS HC A04/MF A01 CSCL 09B

This user's manual describes the capabilities, required input data, and resulting output of SKYDYN, version of the 6 degree-of-freedom digital program REENTR which was extensively modified for the Honeywell CP-V system and was tailored to the specific requirements for SKYLAB. A.R.H.

N80-26057*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN APPLICATION OF SOFTWARE DESIGN AND DOCUMENTATION LANGUAGE

E. D. Callender, T. B Clarkson, and C. E. Frasier Jun. 1980 41 p refs
(Contract NAS7-100)
(NASA-CR-163258; JPL-Pub-80-16) Avail: NTIS HC A03/MF A01 CSCL 09B

The software design and documentation language (SDDL) is a general purpose processor to support a lanugage for the description of any system, structure, concept, or procedure that may be presented from the viewpoint of a collection of hierarchical entities linked together by means of binary connections. The language comprises a set of rules of syntax, primitive construct classes (module, block, and module invocation), and language control directives. The result is a language with a fixed grammar, variable alphabet and punctuation, and an extendable vocabulary. The application of SDDL to the detailed software design of the Command Data Subsystem for the Galileo Spacecraft is discussed. A set of constructs was developed and applied. These constructs are evaluated and examples of their application are considered. A.R.H.

N80-26058# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).

NDTRAN: INTERPRETER OF DYNAMIC SYSTEMS [O INTERPRETADOR DE SISTEMAS DINAMICOS: NDTRAN]

Heloisa Galvao Villela Santos Borges Mar. 1980 64 p refs In PORTUGUESE; ENGLISH summary
Avail: NTIS HC A04/MF A01

Computer methods for system dynamic simulation are examined with specific emphasis on the dynamic modeling translator (DYNAMO) and the Notre Dame Translator (NDTRAN). Both are specific for simulation of continuous time. The characteristics of the NDTRAN and the DYNAMO, together with the NDTRAN language syntax, are presented. Two examples illustrate the use of the NDTRAN. M.G.

N80-26059# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).

ALGORITHMS FOR SAMPLE CLASSIFICATION AND IMAGE FEATURE SELECTION [ALGORITMOS PARA CLASSIFICACAO DE AMOSTRAS E SELECAO DE ATRIBUTOS DE IMAGENS]

Carlos Roberto deSouza, Luiz Rogerio deCamargos, Ravindra Kumar, and Nelson D. A. Mascarenhas Apr. 1980 88 p refs In PORTUGUESE; ENGLISH summary
(INPE-1718-RPE/124) Avail: NTIS HC A05/MF A01

Two algorithms are described for sample classification in Earth resources multispectral imagery. The first one uses the

JM-distance, while the second one is based on the maximum likelihood criterium. A feature selection algorithm was also implemented under the following criteria: average JM-distance and minimum JM-distance. A.R.H.

N80-26060# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
PARTITIONING MULTISPECTRAL IMAGERY OF THE EARTH RESOURCES [PARTICIONAMENTO DE IMAGENS MULTIESPECTRAIS DE RECURSOS NATURAIS DA TERRA]
Walter Kenkiti Takahashi, Adael Woods DecFilho, and Ravindra Kumar Feb. 1980 65 p refs In PORTUGUESE; ENGLISH summary
(INPE-1678-RPE/111) Avail: NTIS HC A04/MF A01

An efficient algorithm is described for partitioning multispectral Earth resources imagery. Statistically homogeneous objects are extracted, for posterior classification. A.R.H.

N80-26061# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
A LANGUAGE FOR SIMULATING DYNAMIC HIERARCHICAL SYSTEMS M.S. Thesis [UMA LINGUAGEM PARA SIMULACAO DE SISTEMAS DINAMICOS HIERARQUIZADOS]
Heloisa Galvao V. S. Borges Apr. 1980 111 p refs In PORTUGUESE; ENGLISH summary
(INPE-1728-TDL/024) Avail: NTIS HC A06/MF A01

A software package for the simulation of hierarchical systems, written for the B6700 computer is described. The main purpose of the package is to simplify the modeling and subsequent simulation of large systems, by considering each of its parts as a subsystem. Flux and level diagrams are used as modeling tools. The HIERTRAN package was programmed utilizing the NDTRAN simulation language. A user's manual as well as implementation details are included. A.R.H.

N80-26062# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
A DIRECT SEARCH PROCEDURE USING LINEAR PROGRAMMING TO GENERATE NUMERICAL SUBOPTIMAL SOLUTIONS IN CONTROL PROBLEMS
Decio Castilho Ceballos and Atair Rios Nero Apr. 1980 7 p refs In PORTUGUESE; ENGLISH summary Proposed for presentation at the 30th Congr. Brasileiro de Automatica, Rio de Janeiro, 16-19 Sep. 1980
(INPE-1725-RPE/130) Avail: NTIS HC A02/MF A01

A direct search procedure, of first order, using linear programming, is proposed to obtain numerical suboptimal solutions in dynamical systems control problems. A particular functional form, dependent upon a set of unknown parameters, is assumed for the control function. Due to its characteristics it can be used in small computers and to generate computer programs of general application. Considerations about the functional form of the control are given and the results of application to a Earth-Mars orbit transfer problem are presented. M.G.

N80-26063# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
LANAC: A HIGH LEVEL LANGUAGE FOR DATA ACQUISITION AND PROCESS CONTROL BY MINICOMPUTERS [LANAC - UMA LINGUAGEM DE ALTO NIVEL PARA ACQUISICAO DE DADOS E CONTROLE DE PROCESSOS POR MINICOMPUTADOR]
Francisco E. C. Viola and Celsa de Renna e Souza Apr. 1980 16 p refs In PORTUGUESE Presented at the 70th Seminar Integrado de Software da Soc. Brasileira de Computacao
(INPE-1721-RPE/126) Avail: NTIS HC A02/MF A01

The 'Revised Report on the Algorithmic Language (ALGOL-6)' is the basis for a language proposed for programming minicomputers that handle data acquisition and the control of parallel processes in real time. The special implementation proposed is for the generation of symbolic codes of the assembly type for the Hewlett-Packard 2116B, and consists of a compiler written in ALGOL B-6700. Transl. by A.R.H.

N80-26064*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
COMPUTER PROGRAM DOCUMENTATION MODIFIED VERSION OF THE JA70 AERODYNAMIC HEATING COMPUTER PROGRAM H800 (MINIVER WITH A DISSPLA PLOT PACKAGE
L. Olmedo Mar. 1980 213 p
(Contract NAS9-15800)
(NASA-CR-160695; LEMSCO-14571; JSC-16500) Avail: NTIS HC A10/MF A01

The changes, modifications, and inclusions which were adapted to the current version of the MINIVER program are discussed. Extensive modifications were made to various subroutines, and a new plot package added. This plot package is the Johnson Space Center DISSPLA Graphics System currently driven under an 1110 EXEC 8 configuration. User instructions on executing the MINIVER program are provided and the plot package is described. A.R.H.

N80-26065*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
AS-BUILT DESIGN SPECIFICATION OF THE DATA ORDER PROCESSOR ORDHDT
A. Rios Mar. 1980 41 p
(Contract NAS9-15800)
(NASA-CR-160694; LEMSCO-14596) Avail: NTIS HC A03/MF A01 CSCL 09B

A description and subroutine documentation of the data order processor, ORHDT is given. As part of the LANDSAT imagery verification and extraction system, ORHDT creates a computer tape containing the AgRISTARS requirements for LANDSAT data to be ordered from Goddard Space Flight Center. A brief description of hardware requirements is also included. M.G.

N80-26066# Wisconsin Univ., Madison. Dept. of Computer Sciences.
ON K-LINE AND K X K BLOCK ITERATIVE SCHEMES FOR A PROBLEM ARISING IN 3-D ELLIPTIC DIFFERENCE EQUATIONS
Seymour V. Parter and Michael Steuerwalt (LASL) Jan. 1980 35 p refs
(Contracts N00014-76-C-0341; W-7405-eng-36)
(AD-A082390; CSTR-374; LA-UR-80-263) Avail: NTIS HC A03/MF A01 CSCL 09/2

Novel computer architectures and a desire to solve three dimensional problems have together aroused new interest in iterative methods for computing solutions to elliptic difference equations. Block iterative methods are particularly attractive for vector machines, such as the CRAY-1. Plane iterative schemes reduce a three dimensional elliptic system to two dimensional systems. We analyze the convergence rate of k-line and k x k block iterative methods for solving these two dimensional problems. GRA

N80-26067# Logos Development Corp., Middletown, N. Y.
DEVELOPMENT OF LOGOSCAN 2 Final Technical Report, Oct. 1978 - Aug. 1979
Charles E. Byrne, John C. Byrne, and Daniel J. Byrne Griffiss AFB, N.Y. RADC Dec. 1979 35 p
(Contract F30602-78-C-0361; AF Proj. 2183)
(AD-A081921; RADC-TR-79-315) Avail: NTIS HC A03/MF A01 CSCL 09/2

The purpose of this report was to test and evaluate the Logoscan II Optical Character Reader System to assess its potential for conversion of free formatted multifont typeset Russian text to a computer processable format compatible with the Russian-English machine translation system at Foreign Technology Division (FTD). Logoscan II scanned 27 pages of Russian text supplied by FTD at approximately 30 characters per second with an error rate of 1.0 - 2.0%. This report discusses the methodology used, technical problems, results, and manpower cost for a production system. GRA

N80-26068# Department of Defense, Washington, D. C.
MILITARY STANDARD, JOVIAL (J73)
15 Mar. 1979 173 p Supersedes MIL-STD-1589
(AD-A081927; DOD-MIL-STD-1589A; MIL-STD-1589) Avail: NTIS HC A08/MF A01 CSCL 09/2

This document is the revised MIL- STD-1589 a USAF definition of the upgraded J73 JOVIAL programming language. The primary purpose of the revision and upgrade was to incorporate into the J73 language some of the proven features of the J3 B-2 language. The sections are organized in a top-down manner. The first section describes the interactions between the modules

of the complete program so that in subsequent sections, the structures of the language can be described to the extent possible without reference to their interaction with other structures. Most sections are divided into separate parts entitled "Syntax," "Semantics," and "Constraints." The "Syntax" descriptions define the grammar of the language in a modified BNF notation. The "Semantics" discussions define the meaning of constructs that satisfy the Syntax and Constraints. The "Constraints" discussions enumerate nonsyntactic requirements that must be met in order for the given constructs to be legal. The intent is that the Syntax, Semantics, and Constraints not be redundant with each other - e.g., the Semantics sections do not normally repeat something that should be obvious from the Syntax, neither do they repeat stipulations that are listed as Constraints. GRA

N80-26068# Carnegie-Mellon Inst. of Research, Pittsburgh, Pa. Dept. of Computer Science.
THE STRUCTURE OF PARALLEL ALGORITHMS Interim Report
H. T. Kung Aug. 1979 60 p refs Submitted for publication
(Contract N00014-76-C-0370; Grant NSF MCS-78-23676)
(AD-A081967; CMU-CS-79-143) Copyright. Avail: Issuing Activity CSCL 09/2

The purpose of this article is to create a general framework for the study of parallel algorithms. A taxonomy of parallel algorithms, based on their relations to parallel computer architectures, is introduced. Examples of parallel algorithms for many architectures are given; they include algorithms for SIMD array processors, for MIMD multiprocessors, and for direct chip implementations. By presenting these algorithms in a single place, issues and techniques in designing algorithms for various types of parallel architectures are discussed and compared. GRA

N80-26070# Boeing Aerospace Co., Seattle, Wash.
SOFTWARE QUALITY ASSURANCE: ONE OF THE SOFTWARE ACQUISITION ENGINEERING GUIDEBOOK SERIES Final Report
M. P. Kress Wright-Patterson AFB, Ohio ASD Jan. 1979 75 p refs
(Contract F33657-76-C-0723; AF Proj. 2238)
(AD-A082425; D180-24700-1; ASD-TR-78-47) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report is one of a series of guidebooks whose purpose is to assist Air Force Program Office Personnel and other USAF acquisition engineers in the acquisition engineering of software for Automatic Test Equipment and Training Simulators. This guidebook describes acquisition engineering and contractor tasks associated with quality assurance and control of software. It provides a practical guide to controlling software life cycle costs through quality assurance. GRA

N80-26071# Naval Ship Research and Development Center, Bethesda, Md.
DIGIT: THE CURVE DIGITIZING SUBSYSTEM OF THE INTERACTIVE DATA DISPLAY SYSTEM Final Report, Sep. 1977 - Apr. 1979
Mary Beth Marquardt Mar. 1980 50 p
(SF43411301)
(AD-A082465; DTNSRDC-80/038) Avail: NTIS HC A03/MF A01 CSCL 09/2

DIGIT is a high-performance interactive graphics program for use in extracting numerical data values (x,y-coordinates) from plots and drawings. It is a subsystem of the Interactive Data Display System (IDDS). In order to digitize, the user needs not only the program but also a digitizing tablet. IDDS, including DIGIT, is designed to run quickly and efficiently. Speed is obtained by minimizing the number of prompts. GRA

N80-26072# System Development Corp., Huntsville, Ala. Aerospace Medical Research Lab.
REDIMEN: SYSTEMS ANALYSIS OF INTEGRATED NETWORKS OF TASKS. SAINT REDIMENSIONING PROGRAM Technical Progess Report, Jul. 1977 - Oct. 1979
Deborah J. Seifert, George Koeplinger (Dayton Univ. Research Inst.), and Constance M. Hoyland (System Development Corp.) Feb. 1980 20 p refs
(Contract F33615-79-C-0505; AF Proj. 7184)
(AD-A082735; SDC-TM-HU-539/000/00; AMRL-TR-80-5) Avail: NTIS HC A02/MF A01 CSCL 09/2

The SAINT (Systems Analysis of Integrated Networks of Tasks) computer programs have fixed storage array dimensions. Different models may have storage requirements less than (or greater than) the presently defined array sizes in SAINT, which makes the SAINT programs inefficient (or impossible to run) unless the common statements in all of the subroutines are redimensioned. This is a laborious, error-prone task. REDIMEN was designed and implemented to eliminate most of the manual labor required to revise the SAINT source codes to tailor array sizes to the model or problem at hand. This document describes the REDIMEN program, its source code, necessary inputs, and its utilization in conjunction with SAINT applications efforts. GRA

N80-26073# Westinghouse Electric Corp., Pittsburgh, Pa.
PRIMER ON COMPUTER GRAPHICS PROGRAMMING Final Report
Richard Puk, Steve Orbon, Robert Bruns, and James M. Jones, II Oct. 1979 212 p refs
(Contract DACW39-78-M-2676)
(AD-A082732; WES-MP-0-79-4) Avail: NTIS HC A10/MF A01 CSCL 09/2

This report is a tutorial for learning graphics programming with the Graphics Compatibility System (GCS). GCS is a collection of ANSI standard FORTRAN subroutines invokable by a user's FORTRAN program. The report covers GCS's capabilities. GCS can produce a simple line drawing or handle comprehensive general purpose axis creation and automatic clipped; arc and conic generation; graphics input; secondary coordinate systems; multiple software character fonts; data structures; segmentation; and color. The report addresses both two and three dimensional graphics capability within GCS. GRA

N80-26074# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Applied Mathematics.
SYNTHESIZED STRUCTURED PROGRAMMING Final Technical Report, 1 Aug. 1975 - 30 Sep. 1978
Zohar Manna Jan. 1980 188 p refs
(Grant AF-AFOSR-3483-78; AF Proj. 5550)
(AD-A082359; RADC-TR-79-326) Avail: NTIS HC A09/MF A01 CSCL 09/2

Techniques of program modification are formulated, and an experimental software system implemented, whereby a given program that achieves one goal can be transformed into a new program to achieve a different goal. The essence of the approach is to find an analogy between the specifications of the given program and of the desired program, and then to transform the given program accordingly. Program debugging is considered as a special case of modification: if a program computes wrong results, it must be modified to achieve the intended results. The abstraction of a set of concrete programs to obtain a program schema and the instantiation of abstract schemata to solve concrete problems are also viewed from the perspective of modification techniques. Two tools are developed as aids in the above tasks: We describe transformation rules for synthesizing code from specifications in a top-down manner. They may be used when - in the course of modifying a program - the need arises to completely rewrite a program segment. For the purpose of determining what an incorrect program actually does, before attempting to debug it, we develop techniques of program annotation. These techniques are expressed as inference rules and derive invariant assertions from the program text. GRA

N80-26075# Sandia Labs., Albuquerque, N. Mex.
COMPARISON BETWEEN RESULTS OF THE HELIOS AND MIRVAL COMPUTER CODES APPLIED TO CENTRAL RECEIVER SOLAR-ENERGY COLLECTION
Charles N. Vittitoe, Frank Biggs, and Patricia L. Leary (Sandia Labs., Livermore, Calif.) Jan. 1980 27 p refs
(Contract EY-76-C-04-0789)
(SAND-79-8266) Avail: NTIS HC A03/MF A01

The computer codes HELIOS and MIRVAL, developed to predict the optical performance of reflecting solar concentrators and to model power collection by central-receiver solar energy power plants are compared in regard to their performance predictions. HELIOS is an analytic code, whereas MIRVAL use Monte Carlo ray-tracing techniques. The sample problems for

comparison consists of a rectangular target and alt-azimuth heliostats deployed in a north field. The results indicate that HELIOS and MIRVAL closely agree on prediction of field performance and of power density on the target plane. DOE

N80-26076# Sandia Labs., Albuquerque, N. Mex. Computer Aids System Development Div.
USER/PROGRAMMER GUIDE FO UCMD 64: DUMPING DRAWING FILES TO TAPE
Donald K. Robbins Jan. 1980 26 p refs
(Contract EY-76-C-04-0789)
(SAND-80-0156) Avail: NTIS HC A02/MF A01

An Applicon AGS/900 user command is described for selectively dumping drawing files onto magnetic tape, through use of an Applicon system. DOE

N80-26077# Sandia Labs., Livermore, Calif. Mechanical Div.
SIXDOF: A COMPUTER PROGRAM FOR TRAJECTORY SIMULATION OF BALLISTIC FLIGHT VEHICLES
Roger N. Everett Oct. 1979 72 p refs
(Contracts EY-76-C-04-0789; DE-AC04-76DP-00789)
(SAND-79-8260) Avail: NTIS HC A04/MF A01

The trajectory computer program, SIXDOF, for use in the flight simulation of ballistic flight vehicles is described. A presentation of the prominent features of the mathematical model which describes the vehicle aero- and flight dynamics is included. Additionally, detailed descriptions of the program input and output are provided as a user's guide. DOE

N80-26078# Sandia Labs., Albuquerque, N. Mex.
SEMICONDUCTOR DEVELOPMENT LABORATORY COMPUTER CONTROL SOFTWARE
Leo A. Doyal Oct. 1979 101 p
(Contract EY-76-C-04-0789)
(SAND-79-1709) Avail: NTIS HC A06/MF A01

A group of programs written to control semiconductor processing in the lab and keep track of device histories during wafer fabrication is described. The software design philosophy is based on a modular structure, relying primarily on FORTRAN programming techniques. DOE

N80-26079# Transportation Research Board, Washington, D.C.
APPLICATION OF COMPUTER AND INTERACTIVE GRAPHICS
Jerome M. Lutin, Yehonathan Hazony, Alain L. Kornhauser, Amir Eiger, Shih-Miao Chin, David Woodin, A. Keith Turner, and David A. Green 1979 28 p refs
(PB80-147051; TRB/TRR-729; ISBN-0-309-02984-8; ISSN-80-10938) Avail: NTIS HC A03/MF A01 CSCL 09B

Topics covered include interactive network model for analysis and cartographics display of railroad traffic flow; computer graphic animation of UTC-1/NETSIM traffic flows; interactive and graphic techniques of computer aided route selection; and improved highway safety through interactive graphics. GRA

N80-26080# General Services Administration, Washington, D.C. Federal Compiler Testing Center.
CII HONEYWELL BULL COBOL V-50.124-4 Validation Summary Report
22 Jan. 1980 64 p
(PB80-146012; CCVS74-VSR525) Avail: NTIS HC A04/MF A01 CSCL 09B

This validation summary report (VSR) for the CII Honeywell Bull Level 64 COBOL Compiler Version 50.124-4 (GCOS-L-64 Version 1-D) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the high level of FIPS PUB 21-1. The VSR is made up to several sections showing discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of descrepancies together with the tests which were failed. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

No abstracts in this category.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N80-26081 Carnegie-Mellon Univ., Pittsburgh, Pa.
DESIGN OF MICROCOMPUTER ADAPTIVE CONTROLLERS Ph.D. Thesis
Robert Leonard Morris 1979 340 p
Avail: Univ. Microfilms Order No. 8010932

Analytic tools for the design of adaptive control algorithms for microcomputer implementation are discussed. Adaptive controllers are self tuning regulators which are conceived to maintain process performance at a specified level in spite of changes in, or lack of knowledge of the process characteristics. The multitude of approaches to adaptive control are cast into a common theoretical framework and compared in the light of practical constraints. Methods of classical control engineering and stability analyses of nonlinear tuning mechanisms are applied to evaluate and interpret these controllers. Novel adaptive controllers are then designed to meet the practical constraints. Process models are simulated on an EAI TR-20 analog computer and the adaptive control algorithm is implemented on a PDP 11/40 mini microcomputer. Adaptive control algorithms are then implemented on an 8080A microcomputer. These algorithms are evaluated by controlling both physical processes simulated on the analog computer and a fractional horsepower dc motor.
Dissert. Abstr.

N80-26082*# Mitre Corp., Houston, Tex.
SOME QUEUING NETWORK MODELS OF COMPUTER SYSTEMS
E. S. Herndon Mar. 1980 56 p refs
(NASA Order T-8231-G; Contract F19628-80-C-0001; AF Proj. 8470)
(NASA-CR-160693; M80-7; JSC-16494) Avail: NTIS HC A04/MF A01 CSCL 09B

Queuing network models of a computer system operating with a single workload type are presented. Program algorithms are adapted for use on the Texas Instruments SR-52 programmable calculator. By slightly altering the algorithm to process the G and H matrices row by row instead of column by column, six devices and an unlimited job/terminal population could be handled on the SR-52. Techniques are also introduced for handling a simple load dependent server and for studying interactive systems with fixed multiprogramming limits. M.G.

N80-26083# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
THE USE OF NEGATIVE FEEDBACK AND CONVOLUTION INTEGRAL IN THE CONTROL OF NONLINEAR INSTABILITY [O USO DE REALIMENTACAO NEGATIVA E INTEGRAL DE CONVOLUCAO NO CONTROLE DA INSTABILIDADE NAO-LINEAR]
Celso Lopes Pereira Neto and Antonio E. Costa Pereira May 1980 6 p refs In PORTUGUESE; ENGLISH summary Proposed for presentation at 30th Congr. Brasileiro de Automatica, Rio de Janeiro, 16-19 Sep. 1980 Revised
(INPE-1733-RPE/133-Rev) Avail: NTIS HC A02/MF A01

Some methods used in the nonlinear instability control are analyzed. It is shown that these methods cause losses in the linear terms. A method that uses negative feedback is developed aiming to correct the instability produced by the positive feedback and employing convolution integral instead of Fourier transform followed by inverse Fourier transform, damping, or artificial viscosity. This method minimizes the losses in the linear terms.
Author

N80-26084# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
OPTIMAL LINEAR ESTIMATION APPLIED TO GENERATE SUBOPTIMAL NUMERICAL SOLUTIONS FOR CONTROL PROBLEMS
Atair Rios Neto May 1980 6 p refs In PORTUGUESE; ENGLISH summary Proposed for presentation at the 30th Congr. Brasileiro de Automatica, Rio de Janeiro, 16-19 Sep. 1980
(INPE-1731-RPE/131) Avail: NTIS HC A02/MF A01

A procedure for the generation of suboptimal numerical solutions in dynamical systems optimal control problems is described. The approximation of the control by a functional dependent upon a finite number of parameters and the adoption of a linear perturbation scheme, with a direct search criterion, reduces the problem, in each iteration, to a parameter optimization. An estochastic interpretation of the search criterion and of the errors due to the linear approximation makes it possible to get the increment in each step by using optimal linear estimation.
M.G.

N80-26085# Minnesota Univ., Minneapolis. Computerized Adaptive Testing Lab.
COMPUTERIZED ADAPTIVE PERFORMANCE EVALUATION Final Report, Feb. 1976 - Jan. 1980
David J. Weiss Feb. 1980 27 p refs
(Contract N00014-76-C-0627; NR Proj. 150-389; RR0420401)
(AD-A082845) Avail: NTIS HC A03/MF A01 CSCL 09/2

Three years of research on computerized adaptive achievement testing are summarized. The goals of the research program are described, and the research approach is summarized and related to the nine technical reports completed under this contract. Major research findings are presented. The implications of the research methods and results for future research in computerized adaptive achievement testing are described. Also included are abstracts of the nine technical reports and a list of other project reports and papers.
GRA

N80-26086# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
SUBOPTIMAL APPROXIMATIONS FOR CONTROL IN OPTIMAL DYNAMIC PROGRAMS M.S. Thesis [APROXIMACOES SUB-OTIMAS PARA O CONTROLE EM PROGRAMAS DINAMICOS DE OTIMIZACAO]
Decio Castilho Ceballos Feb. 1980 187 p refs In PORTUGUESE; ENGLISH summary
(INPE-1676-TDL/019) Avail: NTIS HC A09/MF A01

A method for the numerical solution of suboptimal control problems is described in which the control is taken as a functional dependent on time and a finite number of parameters. In order to test the method, a computer program was developed with the capacity to solve a highly important group of optimization problems, requiring only two subprograms to be supplied. One of them embodies the dynamical equations of motion and the other is the partial differential of the constraints and the performance index equations with respect to final time and state vector. Applying the procedure to an Earth-Mars or orbit transfer problem, tests are made for various approximations of the control. For the previous problem a comparison is presented, relating the results obtained to the numerical optimal solution and to results from suboptimal procedures found in the literature.A.R.H.

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N80-26087*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APPLICATION OF FUNCTIONAL ANALYSIS TO PERTURBATION THEORY OF DIFFERENTIAL EQUATIONS
Victor M. Bogdan and Victor B. Bond May 1980 22 p refs
(NASA-TM-81073; JSC-16507) Avail: NTIS HC A02/MF A01 CSCL 12A

The deviation of the solution of the differential equation y' = f(t, y), y(0) = y sub 0 from the solution of the perturbed system z' = f(t, z) + g(t, z), z(0) = z sub 0 was investigated for the case where f and g are continuous functions on I x R sup n into R sup n, where I = (o, a) or I = (o, infinity). These functions are assumed to satisfy the Lipschitz condition in the variable z. The space Lip(I) of all such functions with suitable norms forms a Banach space. By introducing a suitable norm in the space of continuous functions C(I), introducing the problem can be reduced to an equivalent problem in terminology of operators in such spaces. A theorem on existence and uniqueness of the solution is presented by means of Banach space technique. Norm estimates on the rate of growth of such solutions are found. As a consequence, estimates of deviation of a solution due to perturbation are obtained. Continuity of the solution on the initial data and on the perturbation is established. A nonlinear perturbation of the harmonic oscillator is considered a perturbation of equations of the restricted three body problem linearized at libration point.
A.R.H.

N80-26088# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
MATHEMATICAL METHODS IN PHYSICS: TENSOR ANALYSIS 3 [METODOS MATHEMATICOS DA FISICA: 3 ANALISE TENSORIAL]
Rene A. Medrano-B. Dec. 1979 150 p refs In PORTUGUESE; ENGLISH summary Revised
(INPE-1648-RPE/102-Rev) Avail: NTIS HC A07/MF A01

An introduction to the study of tensors is presented. A treatment of Cartesian tensors is initiated with the derivation of the transformation relations for the components of a vector, through successive angular rotations of an orthogonal system of coordinates (Euler angles). Tensors of higher order are defined by means of the transformation relations of dyadics. The concept of covariant and contravariant tensors is coordinated. Some emphasis is placed on the geometric meaning of the fundamental tensor. Among other important concepts developed are: the contraction, relative tensors, the quotient theorem, Christoffel symbols, and the covariant derivative. Three applications on geodesics, Einstein's gravitational law, and the relativistic form of the Maxwell equations are presented. Whenever possible, illustrative examples are included.
A.R.H.

N80-26089*# Mississippi State Univ., Mississippi State. Dept. of Mathematics.
A COMPARISON OF FINITE DIFFERENCE METHODS FOR SOLVING LAPLACE'S EQUATION ON CURVILINEAR COORDINATE SYSTEMS M.S. Thesis
Melba Jo McCoy 25 Jun. 1980 54 p refs
(Grant NsG-1577)
(NASA-CR-163236) Avail: NTIS HC A04/MF A01 CSCL 12A

Various finite difference techniques used to solve Laplace's equation are compared. Curvilinear coordinate systems are used on two dimensional regions with irregular boundaries, specifically, regions around circles and airfoils. Truncation errors are analyzed for three different finite difference methods. The false boundary method and two point and three point extrapolation schemes, used when having the Neumann boundary condition are considered and the effects of spacing and nonorthogonality in the coordinate systems are studied.
A.R.H.

N80-26090# Virginia Polytechnic Inst. and State Univ., Blacksburg.
INEQUALITIES FOR JOINT DISTRIBUTION OF QUADRATIC FORMS
D. R. Jensen Dec. 1979 19 p refs
(Grant DAAG29-78-G-0172)
(AD-A083033; RR-Q-1; ARQ-15194.2-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Chebychev inequalities were given for joint central and noncentral distributions of k quadratic forms; these were sharpened when k = 2 using the canonical correlations of Hotelling. Complementary inequalities were found as versions of Markov's inequality. Applications were noted in ballistics, in statistical quality control, in establishing consistency of Gauss-Markov estimates under dependence, and in constructing conservative joint confidence sets depending on the underlying distribution only through its low order moments.
E.J.R.

N80-26091# Texas Univ. at Arlington. Dept. of Mathematics.
PROPERTIES OF DIFFERENTIAL EQUATIONS THROUGH DIFFERENT MEASURES Final Report, 1 Jan. 1977 - 31 Dec. 1979

V. Lakshmikantham Mar. 1980 9 p refs
(Grant DAAG29-77-G-0062)
(AD-A082633; ARO-1913881.17-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research is briefly summarized which addressed essentially eight areas of research: (1) reaction-diffusion equations; (2) quasi-solutions and large scale systems; (3) monotone iterative techniques; (4) Hopf bifurcation; (5) basic theory of differential equations in Banach spaces; (6) Sobolev type differential and integral equations; (7) stochastic differential equations; and (8) differential equations with infinite delay. GRA

N80-26092# Texas Univ. at Austin.
APPROXIMATION AND NUMERICAL ANALYSIS OF NONLINEAR EQUATIONS OF EVOLUTION Final Report, 1 Feb. 1977 - 15 May 1980
J. T. Oden 31 Jan. 1980 147 p refs
(Grant DAAG29-77-G-0087)
(AD-A082452; ARO-1914505.12-M) Avail: NTIS HC A07/MF A01 CSCL 12/1

Important results were obtained in four areas: (1) Existence theorems, approximation theorems, a priori error estimates, numerical schemes, and finally computer codes were developed for the analysis of one and two dimensional, one and two phase Stefan problems characterized by variational inequalities; (2) Existence theorems, uniqueness theorems, theorems on the stability and asymptotic stability of solutions, and regularity of solutions were developed for a large class of nonlinear, convective diffusion problems characterized by pseudo-monotone operators; (3) A priori error estimates for Galerkin and Faedo-Galerkin approximations (defined, in general, by finite element methods) were established for nonlinear convection diffusion problems involving general pseudomonotone operators; and (4) Existence theorems were obtained for a large class of nonlinear, degenerate evolution equations with solutions involving free boundaries. Applications to porous media and two-phase Stephan problems were completed. GRA

N80-26093# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
LINEAR EQUATIONS IN GENERAL PURPOSE CODES FOR STIFF ODEs
Lawrence F. Shampine Feb. 1980 13 p refs
(Contract EY-76-C-04-0789)
(SAND-80-0429) Avail: NTIS HC A02/MF A01

It is noted that it is possible to improve significantly the handling of linear problems in a general purpose code with very little trouble to the user or change to the code. In such situations analytical evaluation of the Jacobian is a lot cheaper than numerical differencing. A slight change in the point at the Jacobian is evaluated results in a more accurate Jacobian in linear problems. DOE

N80-26094# Sandia Labs., Livermore, Calif. Gas Dynamics Div.
INVESTIGATION OF ROUTINES FOR INVERTING BLOCK TRIDIAGONAL MATRICES
K. D. Marx Mar. 1980 22 p refs
(Contract EY-76-C-04-0789)
(SAND-80-8206) Avail: NTIS HC A02/MF A01

Numerical experiments were performed to determine the computer time required to invert block tridiagonal matrices on the Sandia CDC 6600 and 7600 computer systems. Timing data for the DECBT/SOLBT and BTMS routines developed are given for various conditions of use. These routines are compared to other options, such as band solvers. A system for solving cyclic tridiagonal systems was derived; timing data for it are presented. The FORTRAN source decks and compiled versions of pertinent routines were collected in a permanent file and a library for general user access. DOE

N80-26095# Encoth Corp., Princeton, N.J.
STEADY STATE BOLTZMANN EQUATION SOLUTION BY NUMERICAL RELAXATION Technical Status Report, Jun. 1979
Timothy M. Smith 1979 44 p
(Contract DE-AC02-79ET-15422)
(DOE/ET-15422/T3; TSR-79-0002) Avail: NTIS HC A03/MF A01

A procedure for the numerical solution of the steady state Boltzmann equation in one configuration space and two velocity space dimensions is described. The diffusive character of the Fokker-Planck collision terms is utilized to construct a numerical relaxation scheme. The mathematical problem and numerical algorithm are discussed, and the present state of computational development is indicated. Details of an existing computer code and results of computations are presented. DOE

N80-26096# General Atomic Co., San Diego, Calif.
ALGORITHM TO INTEGRATE SYSTEMS OF NONLINEAR ORDINARY DIFFERENTIAL EQUATIONS, WITH APPLICATION TO THE ADVANCED FIPER CODE
P. D. Smith 1 Feb. 1980 87 p refs
(Contract DE-AT03-76ET-35300)
(GA-A-15143) Avail: NTIS HC A05/MF A01

A general purpose algorithm for integrating nonlinear systems of ordinary differential equations is presented. A number of specific applications are discussed, such as mixed linear/nonlinear problems, mixed transient/steady state problems, and substructuring. The problem of integrating past singularities is briefly discussed. It is concluded that its efficient use in some of the more complicated problems requires a number of special considerations in the derivation and in the programming. Each application ultimately distills to the following essence: (1) the incremental predictor and corrector phases employ substantially the same steps; (2) the predictor phase is a modified implicit extrapolation of the current rates; (3) the corrector phase is a modified Newton's method based on the residual of a vector function; (4) in partially linear problems one can save steps by matrix partitioning; and (5) The frequency of updates of the tangent matrix is arbitrary, and the calculational efficiency can be optimized by simultaneously varying the size of the time step and the frequency of the matrix updates. DOE

N80-26097# Rice Univ., Houston, Tex. Dept. of Mathematical Sciences.
AUGMENTED LAGRANGIAN METHODS FOR CONSTRAINED OPTIMIZATION: THE ROLE OF THE PENALTY CONSTANT
R. A. Tapia 1979 33 p refs Presented at the Intern. Conf. on Nonlinear Optimization Appl., L'Aquila, Italy, 18 Jun. 1979
(Contract EY-76-S-05-5046)
(DOE/ER-05046/16; CONF-7906140-2) Avail: NTIS HC A03/MF A01

The role of the penalty constant with respect to local convergence and rate of convergence is reviewed. Specifically, in the penalty function method local convergence is obtained if and only if the penalty constant becomes infinite. It is possible to obtain local convergence in the multiplier method for a fixed penalty constant, provided that this constant is sufficiently large. However, superlinear convergence is obtained if and only if the penalty constant becomes infinite. Finally, the quasi-Newton methods are locally superlinearly convergent for fixed values of the penalty constant, and actually the most natural formulation gives an algorithm that is independent of the penalty constant. M.G.

N80-26098# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
SYNCHRONIZATION OF WEAKLY COUPLED RELAXATION OSCILLATORS
M. J. W. Jansen (Vrije Univ., Amsterdam) Jul. 1978 24 p refs
(MC-TW-180/78) Avail: NTIS HC A02/MF A01; Stichting Math. Centrum, Amsterdam FL 3

Existence and approximation problems for periodic solutions of a system of weakly coupled relaxation oscillators are reduced to an algebraic problem. The starting point is a theorem by Mishchenko on periodic solutions of certain singularly perturbed ordinary differential equations. The results obtained are then used to prove some theorems relating to mutually synchronized relaxation oscillations as prototypes of oscillating systems in biology. Author (ESA)

N80-26099# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
SOME CONVEXITY PROPERTIES OF EULER'S GAMMA FUNCTION
J. vandeLune May 1978 16 p refs
(MC-ZW-105/78) Avail: NTIS HC A02/MF A01; Stichting Math. Centrum, Amsterdam FL 2.88

Various convexity properties related to Euler's gamma function are discussed. Most of the properties are generalizations of monotonic approximation theorems for integrals. The theorems are developed and proofs are given. Author (ESA)

N80-26100# Sydney Univ. (Australia).
FINITE ELEMENT ANALYSIS OF PROBLEMS WITH INFINITELY DISTANT BOUNDARIES
J. R. Booker and J. C. Small Nov. 1979 50 p refs
(PB80-149230; R-356) Avail: NTIS HC A03/MF A01 CSCL 12A

A method allowing for the presence of infinitely distant boundaries in prismatic bodies is developed. The method is closely related to the consistent boundary concept used in dynamic applications but the development presented is algebraic and context free and is thus applicable to a wide variety of geotechnical problems both static and dynamic. Author (GRA)

N80-26260# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NUMERICAL BRACKETING OF THE EIGENVALUES OF COMPLEX LINEAR STRUCTURES
Philippe Gibert *In its* La Rech. Aerospatiale, Bimontnly Bull. No. 1979-6 (ESA-TT-632) 1979 p 69-78 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 395-400 Original report in FRENCH previously announced as A80-19992 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N80-26101 Syracuse Univ., N. Y.
CONFIDENCE INTERVAL ROBUSTNESS OF CORRELATION COEFFICIENT Ph.D. Thesis
Sanchen Patricia Chou 1979 195 p
Avail: Univ. Microfilms Order No. 8013366

The problem of constructing robust interval estimate of the Pearson product moment coefficient, rho, when non-normal distributions are considered is investigated. Several robust measures of correlation are investigated including those such as trimmed Pearson coefficient, one version of the biweight measure of correlation. Besides the usual Fisher-Z transformation, two more transformations on measures of correlation are considered for constructing interval estimates of rho. Several contaminated normal distributions were generated. For each distribution, 400 samples were randomly drawn with sample size 20 or 40. Some variance reduction technique was applied to increasing the accuracy of the results. The criteria used to judge the performance of an interval estimate were the robustness of efficiency and robustness of validity. Generally, with sample size 20 the 5 percent trimmed Pearson coefficient is recommended as robust interval estimates of rho. When the sample size is 40, the biweight measure of correlation is preferable.
Dissert. Abstr.

N80-26102 Boston Univ., Mass.
A COMPARISON OF SMOOTH EMPIRICAL BAYES ESTIMATORS Ph.D. Thesis
Jennifer Jane Anderson 1980 159 p
Avail: Univ. Microfilms Order No. 8013200

Two smooth nonparametric empirical Bayes rules for a compound estimation problem are developed. Each method involves explicit estimation of the mixing distribution. The empirical Bayes approach to the compound estimation of a location is reviewed. The derivation and implementation of an estimation based on the assumption of a Dirichlet process hyper-prior for the mixing distribution is discussed. The fully nonparametric maximum likelihood estimator is described and implemented using the EM algorithm. A Monte Carlo investigation of the performance under squared loss of the empirical Bayes rules obtained from the distribution estimates is also reported. Two classes of mixing distributions were simulated: discrete, and continuous with components conjugate to the kernel Gaussian and Poisson kernels and sample sizes between 5 and 50 were included. Each of the rules was found to have a range of conditions to which it is superior to Stein's rule or to a parametric empirical Bayes rule, although no one rule is uniformly better. Dissert. Abstr.

N80-26103 Iowa Univ., Iowa City.
TWO SAMPLE LOCATION AND SCALE TESTS FOR DISTRIBUTIONS WITH THE SAME FINITE INTERVAL OF SUPPORT Ph.D. Thesis
Zainab Selim Soliman 1979 286 p
Avail: Univ. Microfilms Order No. 8012427

Adaptive testing procedures for two sample location and scale type problems, when the populations have continuous densities with the same bounded support for two basic adaptive procedures were developed: one procedure uses the first selection process to classify the shape of the null distribution and the second type of adaptive procedure used the estimated Beta parameters to transform the data. Two different transformations were used, one for the location problem and another for the scale. In both location and scale problems, the testing component of the adaptive procedure is the t-test applied to the transformed data. The performances of the adaptive techniques and other competitors were evaluated by means of Monte Carlo studies. For the location problem, it was shown that the second adaptive procedure, with the moment method used to estimate the parameters, was the best among all tests considered. For the scale problem, both types of adaptive procedures did well. The first adaptive procedure is especially recommended if a conservative test is preferred. The Psi sub S test also did well for symmetric underlying Beta distributions. Dissert. Abstr.

N80-26104 Boston Univ., Mass.
A PROPOSED SOLUTION TO THE BEHRENS-FISHER PROBLEM Ph.D. Thesis
Naomi Schwartz Fineberg 1980 176 p
Avail: Univ. Microfilms Order No. 8013204

A solution to the Behrens-Fisher problem was developed. It is easily applied by non stastisticians who do not have access to sophisticated computer equipment. A complete study is made of the size and power of this test. The robustness of all solutions discussed were examined. Dissert. Abstr.

N80-26105 Yale Univ., New Haven, Conn.
HYBRID CLUSTERING Ph.D. Thesis
Manshek Anthony Wong 1979 125 p
Avail: Univ. Microfilms Order No. 8012510

High density clusters are defined on a population with density f to be the maximal connected sets of form [x/f(x) greater than or equal to C]. It is desired to discover the high density clusters given a random sample of size N from the population. Density estimates generate clusters, namely the high density clusters corresponding to the estimates. The usual kernel type density estimates are expensive to compute, and it is also difficult to determine their high density clusters. A hybrid clustering method is proposed in which observations are first partitioned into a moderate number of clusters by k-means, and the centers of the clusters are then clustered by single linkage. Asymptotic consistency of the method for high density clusters is demonstrated. Empirical comparisons of computing and statistical efficiency are made with single linkage (nearest neighbor density estimation) and mode analysis (kth nearest neighbor density estimation); a very efficient k-means algorithm has been developed which is orders of magnitude faster than the two competing methods. Both artificial and real examples are used to illustrate the performance of this technique. Dissert. Abstr.

N80-26106# California Univ., Livermore. Lawrence Livermore Lab.
JOINT GAUSSIAN PROBABILITY PLOT PROGRAM
S. G. Azevedo and D. T. Gavel Jan. 1980 52 p refs

(Contract W-7405-eng-48)
(UCID-18513) Avail: NTIS HC A04/MF A01

It is shown that the analysis of joint-Gaussian distribution of two variables is aided greatly by meaningful graphical techniques. Two elliptical equi-probability contour plots of the probability density function are produced, one using statistics from the raw data and the other using normalized (zero mean, unit variance) variables. Several separate data sets of the same variables may be plotted, for example, to compare estimators. The techniques discussed for interpreting the plots enable the user to gain insight into the statistical information being displayed. DOE

N80-26107# National Technical Information Service, Springfield, Va.
TIME SERIES FORECASTING AND PREDICTION. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jan. 1980
Jack E. Jones Feb. 1980 195 p Supersedes NTIS/PS-79/0081; NTIS/PS-78/0022; NTIS/PS-77/0042
(PB80-804396; NTIS/PS-79/0081; NTIS/PS-78/0022; NTIS/PS-77/0042) Avail: NTIS HC $30.00/MF $30.00 CSCL 12A

A bibliography containing 188 abstracts concerning the use of time series analysis in predicting and forecasting various events is presented. Both specific applications and general theory studies are included. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N80-26108 Wisconsin Univ. - Madison.
CONTINUOUS TIME SERIES MODELING WITH APPLICATIONS Ph.D. Thesis
Tanakon Ungpiyakul 1979 260 p
Avail: Univ. Microfilms Order No. 8008847

An approach to system and data analysis is introduced in the form of continuous time sense modeling, which develops a stochastic differential equation model from a set of observed discrete data. The parameters in the continuous model are estimated on the basis of the established relationship between the continuous model and the model representing the discrete observations. A nonlinear least squares algorithm is used with the derived expressions for analytical partial derivatives to form a FORTRAN computer program for continuous parameter estimation. The development of a self-contained modeling procedure provides a means to obtain an adequate model from a set of discrete data without requiring any additional information. Two examples of modeling data taken from simulated continuous processes are presented to illustrate the developed modeling procedure. Dissert. Abstr.

N80-26109*# Western Union Telegraph Co., Upper Saddle River, N.J.
THE 30/20 GHz NET MARKET ASSESSMENT
John C. Rogers and Peter Reiner Feb. 1980 151 p
(Contract NAS3-21359)
(NASA-CR-159837) Avail: NTIS HC A08/MF A01 CSCL 12B

By creating a number of market scenarios variations dealing with network types, network sizes, and service price levels were analyzed for their impact on market demand. Each market scenario represents a market demand forecast with results for voice, data, and video service traffic expressed in peak load megabits per second. E.J.R.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N80-26110 Oklahoma State Univ., Stillwater.
UNIFIED HIGHER ORDER PATH AND ENVELOPE CURVATURE THEORIES IN KINEMATICS Ph.D. Thesis
Malladi Narasimha Siddhanty 1979 91 p
Avail: Univ. Microfilms Order No. 8013047

The instantaneous motion of a body and points and lines in that body are analyzed. Included are: a brief review of the state-of-the-art in instantaneous kinematics and curvature theory; determining the intrinsic invariants of a body in spatial motion considering it as a screw motion; determination of the canonical reference system and instantaneous invariants in that system; determination of stretch rotation characteristic numbers for specifying higher curvatures in a dimensionless form; derivation of characteristic equations for points with paths having the same third order characteristic numbers; development of the higher order tangent line envelope curvature theory deriving equations for tangent lines with envelopes having the same third and fourth order characteristic numbers; and discussion of the plans for the extension of the present study. The literature review reveals the need of developing simple methods to analyze instantaneous rigid body motion and develop path and envelope curvature theories. Methods are developed to describe uniquely the instantaneous rigid body motion in space by first, second, and third order screws and associated intrinsic invariants and to determine the canonical reference system and the associated instantaneous invariants from data with time as the parameter. Dissert. Abstr.

N80-26111# Princeton Univ., N. J. Dept. of Statistics.
RESEARCH ON DATA ANALYSIS IN THE PHYSICAL SCIENCES Final Progress Report, Mar. 1973 - Nov. 1979
J. W. Tukey and P. Bloomfield Nov. 1979 229 p
(Contract EY-76-S-02-2310)
(COO-2310-6) Avail: NTIS HC A11/MF A01

The development of data analytic methods and the improvement of existing methods, their implementation on computer, especially minicomputers, and the development of nonstatistical, systems-level software is reviewed. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N80-26112 Pennsylvania State Univ., University Park.
DIGITAL WAVEFRONT RECONSTRUCTION FOR ACOUSTICAL APPLICATIONS Ph.D. Thesis
Robert Leslie Cohen 1979 221 p
Avail: Univ. Microfilms Order No. 8010039

Holographic images of plates vibrating below coincidence frequency show radiation from regions of discontinuity and not from other regions. Digitally reconstructed images from acoustic holograms show the radiating part (far-field component) of the pressure at the source location. The image may be interpreted as a monopole distribution which would generate the same far field as did the original source distribution. A near-field scan records the entire field and yields an image which is proportional to the surface velocity of the plate. It shows the modal pattern of the plate vibration. The holographic far field image is

approximately equivalent to the near field image with the high wave numbers filtered out. Since the far field contains spatial frequencies only up to 1/lambda, image resolution is limited by the acoustic wavelength, i.e., the ideal image is convolved with an Airy pattern. Dissert. Abstr.

N80-26113 Washington Univ., St. Louis, Mo.
ELECTRON-PHOTON INTERACTIONS IN PIEZOELECTRIC SEMICONDUCTORS FOR THE PHASE INSENSITIVE DETECTION OF ULTRASOUND Ph.D. Thesis
Lawrence Joseph Busse 1979 222 p
Avail: Univ. Microfilms Order No. 8013458

A method for the noncoherent detection of ultrasound based upon the acoustoelectric effect in cadmium sulfide investigated. The interaction of ultrasound with conduction electrons in a piezoelectric semiconductor provides a means for making quantitative measurements of ultrasonic intensity in situations where wave propagation through random or regular inhomogeneities results in distortion of the ultrasonic wavefronts. The advantages of a noncoherent detection approach, over phase sensitive detection techniques based upon the direct piezoelectric effect, are demonstrated. A formalism describing the interaction of pulsed ultrasound with a piezoelectric semiconductor prepared in the form of a relatively thick (approximately 1 cm) plate is presented. Methods for the design and construction of practical acoustoelectric receivers are illustrated. A comparison of the response of finite aperture phase sensitive (piezoelectric) receivers and phase insensitive (acoustoelectric) receivers to nonuniform ultrasonic radiation is presented. The applicability of phase insensitive receivers to ultrasonic attenuation imaging using the methods of reconstructive tomography is also demonstrated. Dissert. Abstr.

N80-26114 Iowa Univ., Iowa City.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF THE INTERACTION BETWEEN AN ACOUSTIC FIELD AND CYLINDRICAL STRUCTURE ON SOUND TRANSMISSION LOSS Ph.D. Thesis
Allen Carl Fagerlund 1979 118 p
Avail: Univ. Microfilms Order No. 8012365

A theoretical and experimental investigation of the transmission of sound through the walls of a hollow cylinder is pursued by analyzing the interaction between the sound field and structural vibrations. The method used to investigate the problem is based on an energy balance between the internal acoustic field and the vibrational field of the cylinder wall. After the energy balance is established to determine the parameters to be analyzed, each parameter is then examined separately to determine its effect on the overall solution. Statistical energy methods are used to reduce the complexity of the analysis caused by the high number of interacting modes. Initial tests were conducted with a stationary acoustic field in an air filled cylinder and the static pressure near zero. These showed good agreement with the theory in pipes ranging in diameter from 4 to 12 inches and with wall thickness from .237 to .531 inches. When the static pressure was increased, this resulted in an increase in the density of the fluid. The change in transmission loss due to the static pressure increase was correctly predicted by the current analysis. Dissert. Abstr.

N80-26115*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASURED AND PREDICTED IMPINGEMENT NOISE FOR A MODEL-SCALE UNDER THE WING EXTERNALLY BLOWN FLAP CONFIGURATION WITH A QCSEE TYPE NOZZLE
D. J. McKinzie, Jr. Jun. 1980 63 p refs
(NASA-TM-81494; E-432) Avail: NTIS HC A04/MF A01 CSCL 20A

Jet/flap interaction noise was measured and predicted for a small-scale model two-flap, under-the-wing, externally blown flap configuration equipped with and without noise suppression devices. The devices consisted of short spanwise fairings centered in relationship to the jet axis and positioned in the slots between the wing and flaps. The nozzle approximated that of the Quiet Clean Short-haul Experimental Engine (QCSEE). Takeoff noise reductions of 6 dB in the flyover and 5 dB in the sideline plane were obtained over a wide range of radiation angles. Approach noise reductions of about 5 dB were obtained only in the forward quadrant of the flyover plane; no reductions were obtained in the sideline plane. Models of several noise sources were combined analytically to form an overall noise prediction, the results from which compared favorably with the measured data. The aerodynamic performance characteristics for these configurations were substantially the same in the takeoff attitude. However, in the approach attitude, the suppressed configuration produced a 6 percent reduction in the flow turning efficiency. Author

N80-26116# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Technische Akustik.
OPTIMIZATION OF NOISE BARRIERS
Dieter Lohmann Dec. 1978 64 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-648)
(DFVLR-FB-79-29; ESA-TT-648) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 13.30

The effect of sound barriers on the reduction of noise emitted from the jet engines was studied. The Fresnel-Kirchhoff diffraction integral was solved for sound sources with arbitrary intensity patterns. It is shown that an amplifying effect can arise due to diffraction at the edges of the barrier. Author (ESA)

N80-25486# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NOTES ON VARIOUS NOISE SOURCES
Robert Legendre *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-5 (ESA-TT-613) 1979 p 1-9 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-5, Sep. - Oct. 1979 p 287-292 Original report in FRENCH previously announced as A80-12354 (For primary document see N80-25485 16-31)
Avail: NTIS HC A05/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N80-26117 Oregon Univ., Portland.
SOME ASPECTS OF THE QUARK-PARTON MODEL IN THE WEAK AND THE STRONG INTERACTION PHENOMENOLOGY Ph.D. Thesis
Kamala Prasad Das 1979 162 p
Avail: Univ. Microfilms Order No. 8012306

The exact formulation of the guage models unifying the Weak and the Electromagnetic Interactions or the Lagrangian Field Theory of the Strong Interactions, called Quantum Chromodynamics is dependent on experimental findings. We put forward a model for the Weak Interactions to fit all available experimental data after considering a class of proposed models. A new parameter is added to the standard Weinberg-Salam model in order to give the best fit with the experimental data, and several tests for determining this parameter accurately are proposed. A detailed discussion of various future experimental tests and comparisons that can be made with the other existing models are also considered. These include the asymptotic ratio of antineutrino to neutrino deep-inelastic scattering, elastic scattering from protons, direct decays of charmed mesons into neutral leptonic channels, effects in atomic physics, and coherent neutrino-nucleus scattering. It is shown that although the neutral current experiments are the hardest to perform, this aspect of the Weak Interactions gives the best checks and is one of the better ways to sift through the multitude of models. Dissert. Abstr.

N80-26118 State Univ. of New York at Albany.
STUDIES IN RELATIVISTIC MANY-BODY PERTURBATION THEORY FOR ATOMIC SYSTEMS: HYPERFINE PROPERTIES AND FORBIDDEN OPTICAL TRANSITIONS Ph.D. Thesis
Mina Vajed-Samii 1980 245 p
Avail: Univ. Microfilms Order No. 8013684

The relativistic many-body perturbation theory is successfully

applied to the study of properties and processes in the ground and excited states of atomic systems. The properties and processes studied involve hyperfine interactions, both nuclear magnetic dipole and electric quadrupole interactions, correlation energy and oscillator strengths for forbidden transitions. The two aims of our investigation are first, to obtain accurate theoretical results for the individual systems in order to explain available experimental data and second, to gain physical insight into the nature and importance of relativistic and many-body effects by analyzing the trends followed by the various contributing factors for the different properties and systems studied. For our investigation of the magnetic hyperfine interaction, we have chosen the alkali-metal atom series. The relativistic and the nonrelativistic many-body perturbation approach were used to obtain the hyperfine coupling constant for the ground-state and the first three excited S-states of the rubidium atom, a relatively large and heavy atom of the series. In all the multiplet states the experimental results are explained. Dissert. Abstr.

N80-26119 State Univ. of New York at Albany.
RELATIVISTIC MANY BODY PERTURBATION THEORY: APPLICATION TO SPIN-HAMILTONIAN PARAMETERS OF ATOMS AND IONS WITH HALF-FILLED SHELLS Ph.D. Thesis
Krishnaswamy Raghunathan 1980 124 p
Avail: Univ. Microfilms Order No. 8013681

The relativistic ls coupling scheme is used to construct the ground state of many electron atoms, in particular, of S-state atoms with half filled shells. Some properties of the relativistic ls coupled (rls) ground state are discussed. The rls ground state is compared with that obtained from a multi-configurational approach. The suitability of the rls ground state for many body perturbation theory is discussed and it is seen to permit an appropriate adaptation of Bruckner-Goldstone perturbation expansion for relativistic theory. The high lights of our approach are: (1) the ls coupled basis of the theory permits the use of spin-orbit interaction as a perturbation even on a relativistic ground state and (2) the relativistic nature of the ground state enables the evaluation of the perturbative influence of Breit interaction on many electron wave functions. The rls formalism is tested by applying it to the quadrupole interaction in the ground state of 14 N atom. The relativistic formalism is fully exploited by evaluating the influence of Breit interaction explicitly. It is demonstrated that Breit interaction is crucial for an explanation of the experimental quadrupole interaction observed in this system. Dissert. Abstr.

N80-26120 Carnegie-Mellon Univ., Pittsburgh, Pa.
MOLLER-PLESSET ELECTRON CORRELATION STUDIES OF ATOMS AND SMALL MOLECULES Ph.D. Thesis
John Stephen Binkley 1979 149 p
Avail: Univ. Microfilms Order No. 8012771

The electron correlation problem is studied using Moller-Plesset perturbation theory terminated at second order. The theory is applied to determining the limiting ground state energies of the atoms helium to neon. Using large uncontracted Gaussian basis sets, equilibrium geometries are obtained for the ground states and some excited states of the hydrides AH and AH2 where A is of a first row atom (Li, Be, ..., F). Dissociation energies and the energy separations for states of different spin multiplicity are presented. This second order theory is also applied to determining the equilibrium geometries of some one and two heavy atom molecules. Theoretical structures are compared with available experimental data. Finally, the theory is applied to the questions of the energy ordering of the bridged and classical forms of the vinyl-cation, carbon-beryllium binding in CH2Be, the Lewis acid-base interaction of H2 with BH3 to form BH5, and the predicted energy ordering of the cis- and trans-isomers of 1,2-difluoroethylene. An appendix summarizing the computational details is also included. Dissert. Abstr.

N80-26121 Texas A&M Univ., College Station.
SPECTROSCOPIC STUDIES OF MOLECULAR STRUCTURE AND INTRAMOLECULAR DYNAMICS Ph.D. Thesis
Paul William Jagodzinski 1979 230 p
Avail: Univ. Microfilms Order No. 8011957

In an effort to better understand intramolecular forces, the structure and dynamics of a variety of molecules were analyzed using vibrational spectroscopy, quantum mechanics, and group theory. By examining samples in the solid, liquid, and gaseous phases it was shown that more information concerning intramolecular forces can be obtained from vapor phase studies in which intermolecular forces are minimized. Dissert. Abstr.

N80-26122 Texas A&M Univ., College Station.
IN-DEPTH ANALYSIS OF CONFORMATIONAL CHANGES IN SMALL RING MOLECULES Ph.D. Thesis
Joel Middleton Cooke, Jr. 1979 202 p
Avail: Univ. Microfilms Order No. 8011933

The low frequency far infrared and Raman spectra of 1,3-disilacyclobutane exhibit a series of transitions that are characteristic of the ring-puckering vibration. The motion of 1,3-disilacyclobutane during the ring-puckering vibration was investigated by a one dimensional analysis of the ring-puckering data for isotopically related disilacyclobutanes. The ring-puckering data were analyzed by the inclusion of kinetic energy expansions in the Hamiltonian. The model in which rocking was included fit the data better than the model in which rocking was not allowed. Silacyclobutane-1-d1 gas synthesized and the far infrared spectrum recorded and analyzed. The ring-puckering data for three isotopic forms of silacyclobutane were analyzed simultaneously with kinetic energy expansions incorporated in the Hamiltonian. Theoretical calculations were carried out to determine the importance of subtle effects of the Hamiltonian.
Dissert. Abstr.

N80-26123 Washington Univ., Seattle.
VIBRATIONAL ENERGY TRANSFER BY MOLECULAR COLLISIONS AT HIGH TEMPERATURES UTILIZING THE DIFFUSION CLOUD TECHNIQUE Ph.D. Thesis
John Fred Burkhalter 1980 147 p
Avail: Univ. Microfilms Order No. 8013503

The development of the diffusion cloud technique and its application to the study of unimolecular reactions at high temperatures is discussed. An apparatus was first constructed to study the hydrodynamics of the method, using a nonreacting vapor, mercury. A second apparatus was built for high temperature studies. Cyclopropane was studied at 973 K and 1173 K. Relative collisional efficiencies were determined and the vibrational energy transferred on a collisional basis is reported for the bath gases helium, nitrogen, hydrogen, and carbon dioxide. The average energy down-jump size at 973 K was approximately 200, 400, 150, and 1100 cm-1, respectively. These values decrease with increasing temperature to 1175 K. The absolute rates were determined by a calibration technique. In a separate experiment, the apparatus was modified to collect all of the reactant-product mixture. With this modification, absolute rates were determined at 973 K and 1073 K for 1,1-cyclopropane-d sub 2 with the bath gases nitrogen and helium. The relative rates of the competitive isotopic isomerization channels were also measured. Values of the average energy down-jump size were computed from both the absolute rates and the isotopic relative rates by suitable modeling. Dissert. Abstr.

N80-26124# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THERMODYNAMIC PROPERTIES OF EXTENDED HUBBARD MODEL WITH STRONG INTRAATOMIC ATTRACTION AND ARBITRARY ELECTRON DENSITY
S. Robaszkiewicz (A. Mickiewicz Univ., Poland), R. Micnas, and K. A. Chao (Linkoeping Univ., Sweden) Apr. 1980 35 p refs
Revised
(INPE-1726-NTE/158-Rev) Avail: NTIS HC A03/MF A01

A canonical transformation is used to derive an effective extended Hubbard Hamiltonian with intraatomic repulsion and Ising-type interatomic exchange interaction in an effective external magnetic field from the extended Hubbard model with intraatomic attraction. The absence of magnetic ordering in the original Hamiltonian is transformed into the condition of one quasiparticle per atom. In the strong intraatomic attraction limit, we can further derive from the transformed Hamiltonian an antiferromagnetic anisotropic Heisenberg Hamiltonian in an external field and with a given value of magnetization. A phase diagram of the charge ordered, the singlet superconducting, the mixed, and the nonordered phase is then obtained with the mean field approximation. The collective excitations are examined in the MFA states.

For various special cases results reduce to the known results or the exact solutions. J.M.S.

N80-26125*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
REVIEW OF SPECTROSCOPIC DATA FOR MEASUREMENTS OF STRATOSPHERIC SPECIES
Aaron Goldman, ed. (Denver Univ.) and James Hoell, ed. Jun. 1980 34 p Workshop held at Hampton, Va., 29-30 Oct. 1979
(NASA-CP-2136; L-13768) Avail: NTIS HC A03/MF A01 CSCL 20H

Results and recommendations from a two day workshop are discussed. A review of the current status of experimental and theoretical spectroscopic data on molecules of stratospheric interest is given along with recommendations for additional research. Methods for disseminating new and existing data are also discussed. E.J.R.

N80-26126# Wayne State Univ., Detroit, Mich. Research Inst. for Engineering Sciences.
COLLISIONAL STUDIES OF IONIZATION PROCESSES WITH HEAVY PARTICLE AND PHOTON Final Report, 1 Aug. 1976 - 31 Oct. 1979
Erhard W. Rothe and Gene P. Reck Jan. 1980 31 p refs
(Grants DAAG29-78-G-0136; DAAG29-78-G-0125)
(AD-A082640; ARO-14133.10-C) Avail: NTIS HC A03/MF A01 CSCL 07/4

This is the final report for grant DAAG-29-78-G-0125, which has been a joint project with the Air Force. Advances in chemical dynamics are not usually achieved by a single experiment but rather by a blend of informations using a variety of techniques. As a consequence, the results of this research project may be classified in separate categories: (1) preparation of and experiments with electronically excited atoms and molecules; and (2) measurements of kinetic energy thresholds for ion-pair production from molecular collisions, with subsequent derivation of molecular binding energies and electron affinities. In experiments of type (1) electronically excited sodium was used to promote the chemi-ionization reaction with O2 and SO2. Two photon ionization of Na2 and Li2 was also studied in order to investigate laser selection. GRA

N80-26127# Stanford Linear Accelerator Center, Calif.
CHARMED MESON PRODUCTION AND DECAY PROPERTIES AT THE psi(3770) Ph.D. Thesis
Rafe Hyam Schindler May 1979 220 p refs
(Contracts EY-76-C-03-0515; DE-AC03-76SF-00515)
(SLAC-219) Avail: NTIS HC A10/MF A01

A remeasurement of the resonance near E sub cm = 3.77 GeV in the e(+)e(-) annihilation is presented. The properties of the resonance are used to deduce branching fractions of charmed mesons into hadronic final states. Several previously unseen decay modes are reported. Decays into Cabibbo suppressed final states are observed. The inclusive properties of D meson decays are studied, including strangeness and charged particle multiplicity. The semileptonic branching fractions for D(o) and D sup - or + are measured, providing a determination of the relative lifetimes of these particles. DOE

N80-26128# Illinois Univ., Urbana. Materials Research Lab.
PHONON-DISLOCATION INTERACTION
A. C. Anderson 1979 8 p refs
(Contract EY-76-C-02-1198)
(COO-1198-1281) Avail: NTIS HC A02/MF A01

The physical nature of the interaction of thermal phonons with dislocations is examined through a review of experimental data on crystal of LiF. Thermal conductivity measurements on LiF crystals in the temperature range 0.04 to 30 K demonstrate that, throughout this range, thermal phonons interact with dislocations via a dynamic or resonant process which is highly frequency and phonon mode dependent. The results of earlier work are consistent with this interpretation. DOE

N80-26129# SRI International Corp., Menlo Park, Calif.
IMPORTANT ATOMIC COLLISION PROCESSES IN THE HEAVY ION INERTIAL FUSION PROGRAM
R. E. Olson 24 Aug. 1979 26 p
(Contract EY-76-C-03-0115)
(SAN-0115-137-1) Avail: NTIS HC A03/MF A01

The charge changing cross sections needed to assess the feasibility of using a synchrotron accelerator in the heavy ion fusion program were determined. Two systems were studied in detail, Cs(+) + Cs(+) and Xe(+8) + Xe(+8), for which at a collision energy of 100 keV the charge changing cross sections were predicted to be 4 x 10 to the -16th power sq cm and 1 x 10 to the -16th power sq cm. With reference to collisional processes occurring in the target region of a heavy ion fusion reactor, a model was developed to predict the ionization cross sections of a buffer gas upon passage of a multiply charged ion. DOE

N80-26130# Pennsylvania State Univ., University Park.
OSCILLATOR STRENGTHS FOR HIGHLY IONIZED ATOMIC SYSTEMS Final Report, 1 May 1977 - 30 Dec. 1979
Charlotte Froese Fischer Dec. 1979 19 p refs
(Contract EG-77-S-02-4264)
(COO-4264-13) Avail: NTIS HC A02/MF A01

Oscillator strengths (or f-values) for resonance transitions in highly ionized atoms have assumed importance in fusion plasma research. Beam foil spectroscopy has been able to deduce some of these values but present experimental limitations restrict its applicability. A theoretical study of trends along an isoelectronic sequence has provided an alternative approach. The Multiconfiguration Hartree-Fock method is a general theoretical method for determining wavefunctions for atomic states from which oscillator strengths can be computed. A first order theory has been shown to yield reliable f-values provided the ionization energy is predicted with reasonable accuracy and the transition matrix element is not sensitive to cancellation effects. General computer programs have been developed for this method and extended to include the dominant relativistic effects. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N80-26131# Battelle Pacific Northwest Labs., Richland, Wash.
RESEARCH AND DEVELOPMENT ACTIVITIES: HIGH-LEVEL WASTE IMMOBILIZATION PROGRAM Quarterly Progress Report, Jan. - Mar. 1979
J. L. McElroy, J. E. Mendel, W. F. Bonner, and M. H. Henry Nov. 1979 50 p refs
(Contract EY-76-C-06-1830)
(PNL-3050-1) Avail: NTIS HC A03/MF A01

The conversion of liquid waste, made from zirconium-clad UO2 power reactor fuel with an average burnup of 25,000 MWd/MT, to glass by the in-can melting process is discussed. An intrinsic-gamma melt-level detection system was tested; results showed that if a sufficient number of collimators are used the system will track the melt surface with a precision of 1 in. during the filling of cans with waste glass. One canister contains 116 kg of glass that generated 0.38 kW of self-heat when produced; the other contains 145 kg of glass, and generates 1.01 kW. Spray calcination of simulated Savannah River Plant liquid waste at a rate of 400 L/h was demonstrated in the 36 in. dia. calciner. Five waste forms are being compared: concrete-containing waste calcine, sintered waste glass, glass-ceramic, Synroc B (a crystalline assemblage of titanates), and borosilicate waste glass (composition 76-68). Results of initial tests indicate that the reaction rate of carbon with water, previously found to be very low, may be increased in a radiation field.DOE

N80-26132# Battelle Pacific Northwest Labs., Richland, Wash.
DEVELOPMENT AND CHARACTERIZATION OF SOLIDIFIED FORMS FOR HIGH LEVEL WASTES Annual Report, 1978
W. A. Ross, ed. and J. E. Mendel, ed. Dec. 1979 108 p refs
(Contract EY-76-C-06-1830)
(PNL-3060) Avail: NTIS HC A06/MF A01

Development and characterization of solidified high level waste

forms, directed at determining both process properties and long term behaviors of various solidified high level waste forms in aqueous, thermal, and radiation environments is discussed. Aluminum, nickel and iron were all found to increase the formation of nickel-ferrite spinel crystals in the waste glass. Four multibarrier advanced waste forms were produced on a one liter scale with simulated waste and characterized. Glass marbles encapsulated in a vacuum-cast lead alloy provided improved inertness with a minimal increase in technological complexity. Supercalcine spheres exhibited excellent inertness when coated with pyrolytic carbon and alumina and put in a metal matrix, but the processing requirements are quite complex. Effects caused by decay of actinides can be estimated to saturate at near 10 to the 19th power alpha-events/cu cm in homogeneous solids. Actually, in solidified waste forms the effects are usually observed around certain crystals as radiation causes amorphization and swelling of the crystals. DOE

N80-26133# California Univ., Livermore. Lawrence Livermore Lab.
GEOSCIENCE DATA BASE HANDBOOK FOR MODELING A NUCLEAR WASTE REPOSITORY, VOLUME 1
Dana Sherwood, David Carpenter, Willard Murray, Abelardo Ramirez, Donald Towse, Shosei Serata, Stefan Mönor, and Bartlett Paulding Dec. 1979 327 p refs Prepared in cooperation with Serata Geomech., Inc. Berkeley, Calif. and Geotech. Eng., Inc., Winchester, Mass.
(Contract W-7405-eng-48)
(NUREG-CR-0912-Vol-1; UCRL-52719-Vol-1) Avail: NTIS HC A15/MF A01

Reference information on parameters that should be considered in analyzing or modeling a proposed nuclear waste repository site is presented. In particular, salt as a repository medium is considered. The geology of bedded and dome salt, the geomechanics of salt, hydrology, geochemistry, natural and man-made features, and seismology are discussed. DOE

N80-26134# Cincinnati Univ., Ohio.
INELASTIC STRONG INTERACTIONS AT HIGH ENERGIES Annual Progress Report, 1 Jun. 1979 - 1 May 1980
Peter Suranyi Feb. 1980 9 p refs
(Contract EY-76-S-02-2978)
(COO-2978-5) Avail: NTIS HC A02/MF A01

Results of investigations in the area of grand unified field theories are presented. Various ways of breaking the SU(5) symmetric theory were studied. As usual, an approximate 24 of Higgs breaks the symmetry from SU(5) to SU(3) sub cxSU(2)xU(1). It is found that an approx. 45 of Higgs is acceptable for breaking the symmetry from SU(3) sub cxSU(2)xU(1) to SU(3) sub cxU(1) sub em. In addition phenomenologically correct quark-lepton mass ratios are obtained by use of renormalization group techniques if there are six generations of particles in the theory. Efforts directed at the development of approximate methods for extracting information from quantum field theories were continued. The quantum mechanics of polynomial potentials as a model for quantum field theories was investigated. A perturbation expansion for the energy levels and wave functions was constructed and is proven to be convergent for arbitrary values of the coupling constants, in contrast to ordinary perturbation expansions that have a zero radius of convergence. DOE

N80-26135# Oak Ridge National Lab., Tenn.
NUCLEAR WASTE MANAGEMENT: A PERSPECTIVE
R. E. Leuze 1980 37 p Presented at Am. Nucl. Soc., Tulsa, Okla., 15 Jan. 1980
(Contract W-7405-eng-26)
(CONF-800117-1) Avail: NTIS HC A03/MF A01

The scope of the problems with nuclear waste management is outlined. Present and future inventories of nuclear wastes are assessed for risk. A discussion of what is presently being done to solve waste management problems and what might be done in the future is presented. DOE

N80-26136# Ames Lab., Iowa. Dept. of Physics.
NUCLEAR MAGNETIC RESONANCE WIDE-LINE STUDY OF HYDROGEN IN THE YTTRIUM-YTTRIUM DIHYDRIDE SYSTEM M.S. Thesis
David LaVern Anderson Mar. 1980 126 p refs
(Contract W-7405-eng-82)
(IS-T-877) Avail: NTIS HC A07/MF A01

The H-1 nuclear magnetic resonance was studied in the yttrium hydrogen system (YHx in the composition range 0.20 less than or equal to x less than or equal to 1.98, and temperature range 77K< or equal to T< or equal to 490K). Both alpha and beta phases of YH sub x were investigated in polycrystalline (powdered) specimens. The second moments of the rigid lattice proton resonance were obtained for both alpha and beta phase samples. Analysis of the second moment for alpha YH sub x (alpha phase) indicates that the hydrogen resides in both the tetrahedral and octahedral interstitial sites of the hcp y lattice. Second moment values for beta-YH (beta phase) indicate that a sizeable fraction of the octahedral interstitial sites of the fcc yttrium metal lattice are occupied by hydrogen, while a nonnegligible fraction of the tetrahedral interstitial sites are vacant. The results for beta-YHx also indicate that as the H concentration increases, the probability of H occupation of octahedral sites increases. DOE

N80-26137# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
NUCLEAR INTERACTIONS OF LOW ENERGY LITHIUM IONS Progress Report, 1 Jun. 1979 - 31 May 1980
Edwin Norbeck Feb. 1980 32 p refs
(Contract DE-AC02-79ER-10409)
(COO-10409-1) Avail: NTIS HC A03/MF A01

Elastic scattering Li-8 + Li-8 and Li-7 was studied for E sub b/ =2.0 to 5.5 MeV. A double folding optical potential model provided a good fit to the data for Li-7 + Li-7, over the entire energy range and for Li-8 + Li-8 with energies low enough so that the breakup Li-8 yields alpha + d does not occur. At higher energies, the potential falls off rapidly. At 5.5 MeV the potential well was 36% as deep as was predicted by the folding model. The 2.0 MeV double folded potential allowed a magnificient fit to the experimental data when the 2Li-8 yields 3 alpha reaction was used in a DWBA calculation. The total cross section for producing a neutron from Li-7 + Li-7 was measured for a number of energies. These cross sections compare favorably with the total reaction cross section calculated from the partial wave amplitudes generated from the folding model potentials. The cross sections were large. The cross section at E sub b = 4.0 MeV was 0.475 b. DOE

N80-26138# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
SUMMARY OF THE FUSION-FISSION HYBRID FUEL CYCLE ANALYSIS (TRITIUMLESS HYBRIDS)
G. A. Moses, comp. Dec. 1979 34 p refs
(Contract EY-76-S-02-2272)
(UWFDM-337) Avail: NTIS HC A03/MF A01

Fusion-fission hybrid reactors were used for the fusion to impact the energy productions. The elimination of the tritium breeding function in the fusion blanket and its effect on the early introduction of hybrid reactors are discussed. DOE

74 OPTICS

Includes light phenomena.

N80-26139 Howard Univ., Washington, D. C.
APODIZATION OF OPTICAL SYSTEMS WITH POOR RESOLVING POWER Ph.D. Thesis
John Ngumi Kibe 1979 146 p
Avail: Univ. Microfilms Order No. 8013097

Wilkins proposed and solved the problem, referred to as problem A, of finding for a passive rotationally symmetric optical system a pupil function that produces a diffraction pattern for a point object on the optical axis that has a specified Rayleigh limit of resolution. Barakat has formulated and attacked the problem, referred to as problem B, of maximizing the central irradiance when the diffraction patterns are required, in addition, to have the same over-all transmittance, specified in advance. The mathematical formulation, used for the physical problems just stated is that conventionally accepted in apodization theory.

When thus formulated, the stated problems are ones in the calculus of variations with inequalities as constraints. The pupil functions found for problem A by applying a general theory for such variational problems are step functions with values + or - 1 and with two discontinuities the locations of which depend on the specified limit of resolution. In problem B, the similarly found pupil functions depend on the value of the over-all transmittance and the Rayleigh limit of resolution. In light of this, some pupil functions will be smooth; others will consist of two or more smooth pieces intersecting at corners, depending on how large the over-all transmittance is for each case.
Dissert. Abstr.

N80-26140# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EIGENVALUES FOR UNSTABLE RESONATORS WITH SLIGHTLY MISALIGNED STRIP MIRRORS
C. Santana and L. B. Felsen May 1980 17 p refs Revised Submitted for publication
(INPE-1738-RPE/137-Rev) Avail: NTIS HC A02/MF A01

Very small misalignments in unstable strip resonators may cause detachment of the low loss eigenmode at lower equivalent Fresnel number, N sub eq, and introduce different periodicities into the eigenvalue curve as a function of N sub eq. Using the resonance equation developed previously from waveguide mode theory, this behavior is explained in physical terms by coupling between mode fields with even and odd symmetry, which are uncoupled in the perfectly aligned configuration. A simplified explicit equation derived for the eigenvalues of the detached mode is found to predict correctly the periodicities of the eigenvalue oscillations. The waveguide method continues to provide an explicit and reliable procedure for rapidly locating the maxima and minima of the detached mode eigenvalues over broad ranges of N sub eq.
Author

N80-26141# Hughes Research Labs., Malibu, Calif.
INFRARED FIBER OPTICS Interim Technical Report, 14 Apr. 1978 - 14 Apr. 1979
J. A. Harrington, R. Turk, M. Henderson, and Jon Myer Griffiss AFB, N.Y. RADC Dec. 1979 52 p
(Contract F19628-78-C-0109; AF Proj. 2306)
(AD-A082450; RADC-TR-79-290) Avail: NTIS HC A04/MF A01 CSCL 20/6

This interim technical report summarizes the first year's research efforts to fabricate optical communications fibers that are transmissive between 1 and 12 micrometers. The ultimate objective of this program is to prepare infrared transmitting fibers with losses less than 5 dB/km. In preparing infrared transparent fibers with these losses, we are emphasizing the extrusion into fiber of very pure KCl as this material has demonstrated bulk losses equal to or less than 5 dB/km in the 2 to 6 micrometers region. The primary approach used to meet the program goals, therefore, was the extrusion of reactive atmosphere process (RAP) grown KCl into 250 to 1000 micrometers-diameter optical fibers. After one year of effort, the best KCl fiber extruded had a loss of 4200 dB/km. This report also summarizes our efforts in fabricating a special infrared fiber prototype device for the detection of pulsed CO2 laser radiation. The prototype device, which is to be used in a battlefield identification friend or foe (BIFF) application, was successfully field tested in Germany.
GRA

N80-26142# Hughes Research Labs., Malibu, Calif.
MICROWAVE FIBER OPTICS DELAY LINE Final Report, 25 Jun. - 24 Dec. 1979
C. Slayman and H. W. Yen Jan. 1980 31 p
(Contract N00173-79-C-0098)
(AD-A082505) Avail: NTIS HC A03/MF A01 CSCL 20/6

A microwave delay line is one of the devices used in EW systems for preserving the frequency and phase contents of RF signals. For such applications, delay lines are required to have large dynamic range, wide bandwidth, low insertion loss, and a linear response. The basic components of a fiber-optics delay line are: an optical source, a wideband optical modulator, a spool of single-mode fiber with appropriate length to provide a given microwave signal delay, and a high-speed photodetector with an RF amplifier. This contract program is to study the feasibility of such a fiber-optic delay line in the frequency range of 4.0 to 6.5 GHz. The modulation scheme studied is the direct modulation of injection lasers. The most important issue identified is the frequency response of the injection laser and the photodetector.
GRA

N80-26143# Cornell Univ., Ithaca, N. Y.
OPTICAL PROPERTIES OF METALLIC SURFACES, SMALL PARTICLES AND COMPOSITE COATINGS FOR SOLAR ENERGY CONVERSION APPLICATIONS Final Technical Report, 1 Apr. 1977 - 31 Aug. 1979
N. W. Ashcroft, R. A. Buhrman, A. J. Sievers, and J. W. Wilkins Dec. 1979 26 p refs
(Contract EG-77-S-03-1456)
(DOE/ET-20413/1) Avail: NTIS HC A03/MF A01

A combined theoretical experimental-program to understand the optical properties of heterogeneous materials is described. The primary experimental quantity measured was the optical response from the visible to the far infrared. The production, structure and optical properties of composite metal-insulator cermet films were investigated. Using effective medium theories the optical properties were calculated and compared to experimental measurements. Studies of the design of spectrally selective solar energy absorbers using cermet films were made both experimentally and with computer simulation. Composite films were produced by controlled coevaporation of the metal and an insulator. The materials used include Ni, V, Fe, and Pt metals with dielectrics Al2O3, SiO2, MgO and ZrO2. Some preliminary results on amorphous aluminum are described. Crystalline aluminum has the disadvantage that its reflectance in the visible is smaller than those of some good free electron metals such as silver, which is unsuitable as a front surface reflector because of rapid corrosion. Interband transitions depress the reflectivity of aluminum in the solar spectrum. If these interband transitions could be eliminated and the free electron reflectance of aluminum obtained, a superior reflective coating would result.
DOE

N80-26144# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Physics.
MECHANICAL AND DIELECTRIC PROPERTIES OF OPTICAL FILMS Final Report
R. P. Wanz, J. F. Fontanella, M. Shure, R. W. Hoffman, and D. E. Schuele 1979 61 p refs Prepared for California Univ., Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(UCRL-15098) Avail: NTIS HC A04/MF A01

The intrinsic stress and microstructure of vacuum deposited TiO sub s thin films were studied as a function of oxygen partial pressure and substrate temperature (T sub s). Auger electron spectroscopy combined with Rutherford backscattering spectroscopy provided quantitative depth profiles of composition. Transmission electron microscopy and selected area diffraction allow structural characterization. For T sub s < 150 C the films are amorphous and the stress is independent of film thickness. In addition, stress changes occur upon exposure to room air resulting in a final stress of 3 x 10 to the 9th power dynes sq cm independent of the oxygen partial pressure and substrate temperature. At T sub s = 300 C the stress is again constant with film thickness having a value of 6 x 10 to the 9th power dynes sq cm independent of the oxygen partial pressure. However, the stress is stable upon exposure to room air. At T sub s = 300 C the films are polycrystalline with regions of TiO2 (anatase). Compositional data showed large variations, possibly indicating a void structure with varying quantities of water vapor.
DOE

N80-26145# Sandia Labs., Albuquerque, N. Mex.
FRACTURE ANALYSIS OF OPTICAL FIBERS
J. J. Mecholsky 1980 18 p refs Presented at Fiber Optic in the Nucl. Environment Symp., Adelphi, Md., 25 Mar. 1980
(Contract EY-76-C-04-0789; DARPA Order 3285)
(SAND-79-2431C; CONF-800307-3) Avail: NTIS HC A02/MF A01

The quantitative relation of the fracture markings on glass optical fiber surfaces to the strength and time under load is demonstrated. Knowledge of the fracture initiating defects and the surrounding topography pinpoints the source of failure, aids in troubleshooting, and improves production procedures. It is

shown that the techniques of fracture surface analysis help analyze in-service failures as well as improve fiber optic production control. DOE

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N80-26146 Massachusetts Univ., Amherst.
EXPERIMENTAL INVESTIGATION OF GAS FLOW DYNAMICS OF AN INDUCTIVELY COUPLED ARGON PLASMA Ph.D. Thesis
John Lawrence Genna 1980 360 p
Avail: Univ. Microfilms Order No. 8012605

The flow phenomena of an argon inductively coupled plasma was investigated utilizing impact pressure measurements, high speed photography, and Schlieren photography. In addition, in order that local argon physical properties within the discharge, such as viscosity and density, could be calculated, detailed temperature determinations were performed utilizing the absolute intensities of Ar I lines and argon continuum. Measurements were performed over a variety of flow conditions including variations in flow rate of the plasma and aerosol flows. In addition, several torch configurations were investigated. A modification of the conventional ICP torch was made which increased the swirl velocity of the plasma gas allowing for reduced gas consumption while maintaining the analytical performance characteristics of conventional torches. Velocity measurements indicate three well-defined regions within the ICP. These include the aerosol channel, luminous core region, and a high plasma flow region near the torch walls. Both temperature and velocity measurements indicate little interaction of these flow regions while still within the confines of the plasma torch. Dissert. Abstr.

N80-26147 Pennsylvania Univ., Philadelphia.
TWO DIMENSIONAL ANALYSIS OF THE PHOTOIONIZATION CHAMBER Ph.D. Thesis
Donald Michael Giorgione 1979 149 p
Avail: Univ. Microfilms Order No. 8009407

An analysis of the photoionization chamber is presented wherein the rate of ionization is assumed to vary with both x (normal to chamber centerline) and z (parallel to the chamber center-line). Depending on the degree of ionization, which is proportional to alpha, the analysis can naturally be divided into three distinct regions. At relatively high ionization rates ambipolar diffusion occurs. In this region the ion and electron densities are necessarily large to balance production. The electric field, however, must remain finite. This region is known as the quasi-neutral region. The boundary layer equations are obtained by rescaling variables. For relatively low rates of ionization the free diffusion region exists. In this region the ion and electron densities are necessarily small. The potential due to charge separation is also small but the applied battery voltage, V, is arbitrary. When V is O(alpha), the governing equations can be simplified to the extent that analytical solutions can be obtained. However, when V is large, solutions must be obtained numerically. For intermediate rates of ionization between these two limits, no simplification of the governing equations occurs, and solutions must be obtained using numerical methods. Dissert. Abstr.

N80-26148 College of William and Mary, Williamsburg, Va.
NONLINEAR EVOLUTION OF THE MAGNETOHYDRODYNAMIC SHEET PINCH Ph.D. Thesis
William Henry Matthaeus 1979 200 p
Avail: Univ. Microfilms Order No. 8014019

The evolution of a sheet pinch is simulated using a spectral-method, incompressible, two dimensional turbulence code. Several diagnostics are employed, especially contour plots of the relevant fields, which display the status of the system visually. The nonlinear effects which seem to be the most important are current filamentation: a concentration of electric current density onto sets of small measure near a magnetic X-point, and rapid expulsion of magnetofluid from the X-point region parallel to the current sheet. Dissert. Abstr.

N80-26149 Tennessee Univ., Knoxville.
CHARGE EXCHANGE MEASUREMENTS OF ION BEHAVIOR IN THE ISX TOKAMAK Ph.D. Thesis
George Hutchinson Neilson 1979 198 p
Avail: Univ. Microfilms Order No. 8012481

Analysis of charge exchange neutrals is the standard method for measuring ion behavior in Tokamak plasmas. Limitations of this technique, which arise in dense and neutral beam heated plasmas, are discussed. Two refinements which address these limitations are described: a neutral particle analyzer which incorporates both mass and energy resolution to distinguish different ion components such as the fast and thermal ions in beam-heated plasmas; and an improved data analysis procedure which accounts for the effects of profiles and neutral attenuation in dense plasmas. A simple Monte Carlo neutral transport code was developed and used to investigate the effects of toroidally asymmetric neutral density profiles. Applications of these methods to experiments in ISX are discussed; they include energy confinement studies on ISX-A, neutral beam heating and high beta studies on ISX-B and pellet fueling studies on ISX-B. Dissert. Abstr.

N80-26150 Washington Univ., Seattle.
STIMULATED RAMAN SCATTERING FROM AN UNDERDENSE HYDROGEN PLASMA Ph.D. Thesis
Robert Gregory Watt 1979 195 p
Avail: Univ. Microfilms Order No. 8013613

Measurements of wavelength shifted backscattered radiation from several underdense hydrogen plasmas irradiated with high intensity 10.6 laser radiation was performed. Wavelength shifts consistent with those predicted for the stimulated Raman scattering parametric instability were observed. The intensity dependence of the backscattered radiation was shown to be exponential as predicted. An apparent saturation was observed at the highest intensity levels used which cannot be explained by the traditional nonlinear saturation mechanisms. A macroscopic temperature increase and corresponding density decrease due to classical inverse bremsstrahlung heating was proposed as the cause of this apparent saturation. The frequency dependence of the backscatter was shown to be more complicated than predicted on the basis of the infinite, homogeneous plasma theory. Observations of spectrally resolved backscatter with a wavelength shift consistent with that predicted for stimulated Brillouin scattering were made in the higher density and temperature plasma. Indirect evidence of the presence of stimulated Brillouin scattering was observed in the low density and temperature experiment. Dissert. Abstr.

N80-26151# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EFFECT OF ION DYNAMICS ON RELATIVISTIC NONLINEAR PLASMA OSCILLATIONS
Abraham C.-L. Chian Apr. 1980 37 p refs Revised
(INPE-1704-RPE/122-Rev) Avail: NTIS HC A03/MF A01

Relativistic nonlinear longitudinal waves in a cold plasma are studied by including ion dynamics in the analysis. All wave velocities are considered. Wave solutions with arbitrary plasma stream velocities are obtained by a suitable choice of a dynamic parameter. The solutions of the problem can be reduced to two equations related to conservation of energy and momentum of the system. For large amplitude waves, ion dynamics play an important role in the wave properties. Author

N80-26152# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RELATIVISTIC NONLINEAR CYCLOTRON WAVES IN A HOT ELECTRON-ION PLASMA
A. C.-L. Chian Apr. 1980 14 p refs Revised Submitted for publication
(INPE-1723-RPE/128-Rev) Avail: NTIS HC A02/MF A01

The propagation of relativistic nonlinear circularly polarized waves along a uniform magnetic field in a streaming hot electron-ion plasma is examined. It is shown that, in the presence of extremely intense waves, the ions play an important role on

wave properties. In addition, it is shown that a finite temperature increases the effective inertia of plasma. Author

N80-26153# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TWO-DIMENSIONAL EQUILIBRIUM OF FIELD-REVERSED ION RINGS
Gerson Otto Ludwig May 1980 46 p refs Revised
(INPE-1724-RPE/129-Rev) Avail: NTIS HC A03/MF A01

The axially symmetric equilibrium of intense ion rings is examined for field-reversed configurations. A rigid rotor model is assumed for the ion distribution, with background or accompanying electrons providing space charge neutralization. This equilibrium configuration is described by three macroscopic quantities, the ring particle density, the ring pressure, and the azimuthal component of the vector potential. Within the Vlasov-Maxwell framework, these quantities must satisfy Ampere's law and the pressure balance equation. The system of equations is completed assuming that the pressure and the density satisfy a general power law (equation of state). The equilibrium solution for intense ion layers (one dimensional problem) is examined in the general case, but for intense ion rings (two dimensional problem) the analysis is restricted to the uniform particle density case. The sharp boundary that separates the constant density and zero density regions is approximated by a stepwise function and determined for several values of the ring parameters. Author

N80-26154# Nagoya Univ. (Japan). Institute of Plasma Physics.
NEW TYPE OF RAY TRAJECTORY OF THERMAL MODE IN AN INHOMOGENEOUS MAGNETOPLASMA
H. Sanuki, T. Watanabe (Hiroshima Univ.), and T. Ohnuma (Tohoku Univ.) Mar. 1980 17 p refs
(IPPJ-447) Avail: NTIS HC A02/MF A01

The three dimensional behavior of the ray trajectory of thermal modes are numerically investigated. The ray trajectory of the thermal mode is shown to represent a different type of ray characteristic from the usual resonance cone. The preliminary numerical results associated with the ray tracing of thermal mode in an inhomogeneous magnetoplasma are presented. E.D.K.

N80-26155# Nagoya Univ. (Japan). Institute of Plasma Physics.
A DISC LaB6 CATHODE FOR PLASMA PRODUCTION IN MAGNETIC FIELD
Joshin Uramoto, Kazushige Ishii, and Yusuke Kubota Mar. 1980 10 p refs
(IPPJ-448) Avail: NTIS HC A02/MF A01

A disc LaB6 cathode is proposed in order to improve demerits of a cylindrical LaB6 cathode when a plasma source is produced by a discharge in a magnetic field. Author

N80-26156# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NONLINEAR ALFVEN WAVE IN AN ULTRA-RELATIVISTIC ELECTRON-POSITRON PLASMA
Jun-ichi Sakai and Tutomu Kawata Mar. 1980 16 p refs
(IPPJ-449) Avail: NTIS HC A02/MF A01

A nonlinear Alfven wave propagating parallel to a constant magnetic field in an ultrarelativistic electron-positron plasma is investigated in the frame of a covariant two fluid model equation. The basic equations are derived from the Einstein equation, Maxwell equations, and the continuity equation in the case of special relativity. The derivation for the equation describing the nonlinear evolution of a circular polarized Alfven wave is presented. Finally, some stational solutions (bright solitons, kink solution, spiky soliton with rapid phase rotation) are discussed. M.G.

N80-26157# Nagoya Univ. (Japan). Inst. of Plasma Physics.
WAVES IN AN ULTRA-RELATIVISTIC ELECTRON-POSITRON PLASMA
Jun-ichi Sakai and Totumu Kawata Mar. 1980 15 p refs
(IPPJ-450) Avail: NTIS HC A02/MF A01

Basic equations describing the macroscropic behavior of an ultrarelativistic plasma are formulated in a covariant form. Waves in an electron-positron plasma are investigated in the frame of a two fluid model equation. Dispersion relations for electrostatic waves, electromagnetic waves and Alfven waves propagating parallel to a constant magnetic field are shown. In the case that both electron and positron gases have the same temperature, there does not exist the slow mode which corresponds to the ion acoustic wave. Right and left circular polarized waves propagate with the same dispersion relation which is different from that of the nonrelativistic electron-ion plasma. M.G.

N80-26158# Nagoya Univ. (Japan). Institute of Plasma Physics.
NEGATIVE SHEAR FERROMAK FOR STABILIZATION OF CURRENT DISRUPTIONS IN TOROIDAL DISCHARGE
Kazunari Ikuta Mar. 1980 10 p refs
(IPPJ-451) Avail: NTIS HC A02/MF A01

A possibility to realized (1-2)+(1-3) magnetic configuration with the help of ferromagnetic material is analyzed with an aim to control the current disruption occuring in Tokamaks. By a careful choice of parameters it is not difficult for a negative shear configuration to be reduced into practice by the use of standard soft irons, where the negative shear configuration means the one whose rotational transform decreases as it moves outwards from the magnetic axis. J.M.S.

N80-26159# Nagoya Univ. (Japan). Inst. of Plasma Physics.
A QUICK START OF HIGH CURRENT DISCHARGE FROM A COLD LaB6 CATHODE FOR NEUTRAL BEAM INJECTION
Joshin Uramoto Mar. 1980 21 p refs
(IPPJ-453) Avail: NTIS HC A02/MF A01

A cathode system with a high current density, long life, fast rise time at discharge, and mechanical simplicity is described for use in the fast neutral beam injection of thermonuclear fusion. A cold LaB6 cathode with a large heat capacity can be used for a high current discharge which needs a fast rise time (below 0.1 sec) if the discharge is fired twice in series. The temperature decay of the cathode after the first discharge held to a very slow rise time to protect the cathode) is very slow. The second discharge rises up quickly due to remaining heat and the effective plasma confinement in the cathode system even if a time interval between in the first and the second is near 30 sec. M.G.

N80-26160# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PARTICLE SIMULATION STUDIES ON BEHAVIOR OF LASER-PRODUCED HIGH-BETA PLASMA IN A MAGNETIC FIELD
Masamitsu Aizawa, Tadashi Sekiguchi (Tokyo Univ.), Yukiharu Ohsawa, Kohnosuke Sato, and Tetsuo Kamimura Mar. 1980 42 p refs
(IPPJ-452) Avail: NTIS HC A03/MF A01

Macroscopic and microscopic behaviors of the laser produced high-beta plasma were studied by the magnetostatic particle simulation code. The expansion process of the plasma, the rethermalization phenomena, the structure of high-beta sheath and the instability are examined in detail. As the plasma radius becomes maximum, the shell structure of the density appears. The thermalization of the expansion energy occurs and the instability arises in this shell. This instability is similar to that observed in the experiments and the growth rate is almost equal to that of the lower hybrid drift instability. When the expansion stops, the width of the sheath is nearly equal to the hybrid Larmor radius. J.M.S.

N80-26161*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ION EXTRACTION FROM A PLASMA Ph.D. Thesis. Progress Report, 1 Dec. 1979 - 1 Dec. 1980
Graeme Aston Jun. 1980 93 p refs
(Grant NGR-06-002-112)
(NASA-CR-159849) Avail: NTIS HC A05/MF A01 CSCL 20I

An experimental investigation of the physical processes governing ion extraction from a plasma is presented. The screen hole plasma sheath of a multiaperture ion accelerator system is defined by equipotential plots for a variety of accelerator system geometries and operating conditions. A sheath thickness of at least fifteen Debye lengths is shown to be typical. The electron density variation within the sheath satisfies a Maxwell Boltzmann density distribution at an effective electron temperature

dependent on the discharge plasma primary to Maxwellian electron density ratio. Plasma ion flow up to and through the sheath is predominately one dimensional and the ions enter the sheath with a modified Bohm velocity. Low values of the screen grid thickness to screen hole diameter ratio give good ion focusing and high extracted ion currents because of the effect of screen webbing on ion focusing. Author

N80-26162*# Argonne National Lab., Ill.
MODIFIED NASA-LEWIS CHEMICAL EQUILIBRIUM CODE FOR MHD APPLICATIONS
R. A. Sacks, H. K. Geyer, S. J. Grammel, and E. D. Doss Dec. 1979 60 p refs
(Contract W-31-109-eng-38)
(NASA-TM-80903; ANL/MHD-79-15) Avail: NTIS HC A04/MF A01 CSCL 20I

A substantially modified version of the NASA-Lewis Chemical Equilibrium Code was recently developed. The modifications were designed to extend the power and convenience of the Code as a tool for performing combustor analysis for MHD systems studies. The effect of the programming details is described from a user point of view. DOE

N80-26163# Columbia Univ., New York. Plasma Lab.
NUMERICAL SIMULATION STUDIES OF TOROIDAL PINCHES
Wonchull Park 1978 157 p refs
(Contract EY-76-S-02-2456)
(COO-2456-57) Avail: NTIS HC A08/MF A01

A time dependent two dimensional magnetohydrodynamic calculation for pinch experiments is improved and modified so that very long calculations (until the plasma reaches a quasi-equilibrium state) are possible. The calculation method is presented, and the simulation results of the Jutphaas screw pinch SP-1 and the Los Alamos reverse-field pinches ZT-I, ZT-S, and ZT-40 are studied. DOE

N80-26164# Columbia Univ., New York. Plasma Lab.
SPECTROSCOPIC STUDY OF TURBULENT HEATING IN THE HIGH BETA TOKAMAK, TORUS 2 Ph.D. Thesis
George E. Georgiou 1979 144 p refs
(Contract EY-76-S-02-2456)
(COO-2456-70) Avail: NTIS HC A07/MF A01

Visible spectroscopy, involving line profile and line intensity measurements, was used to study the turbulent heating of the rectangular cross section high beta Tokamak Torus II. The spectroscopy was done in the visible wave length region using a six channel polychrometer having 0.2 A resolution, which is capable of radial scans of the plasma. The plasma, obtained by ionizing helium, is heated by poloidal skin currents, induced by a rapid (tau/sub R/ approximately 1.7 microsec) change of the toroidal magnetic field either parallel or antiparallel to the initial toroidal bias magnetic field, which converts a cold toroidal Z-pinch plasma into a hot Tokamak plasma. DOE

N80-26165# California Univ., Livermore. Lawrence Livermore Lab. National Magnetic Fusion Energy Computer Center.
MAGNETIC CONFINEMENT IN PLASMAS IN NUCLEAR DEVICES
Carol G. Tull 12 Jul. 1979 13 p refs Presented to the Soc. of Women Engr., San Francisco, 25 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82765; CONF-790698-3) Avail: NTIS HC A02/MF A01

The main emphasis of the magnetic fusion energy research program today lies in the development of two types of confinement schemes: magnetic mirrors and Tokamaks. Experimental programs for both of these confinement schemes have shown steady progress toward achieving fusion power break-even. The scaling of the current machines to a reactor operating regime and newly developed methods for plasma heating will very likely produce power break-even within the next decade. Predictions are that the efficiency in a fusion power plant should exceed 32%. DOE

N80-26166# Argonne National Lab., Ill. Engineering Div.
CONVECTIVE HEAT TRANSFER IN MHD CHANNELS AND ITS INFLUENCE ON CHANNEL PERFORMANCE
R. K. Ahluwalia and Ezzat D. Doss 1980 12 p refs Presented at 18th AIAA Aerospace Sci. Meeting, Pasadena, Calif., 14-16 Jan. 1980
(Contract W-31-109-eng-38)
(CONF-800104-5) Avail: NTIS HC A02/MF A01

The limitations of the integral boundary layer methods and the potential of the differential boundary layer method in analyzing MHD channel flows are assessed. The sensitivity of results from the integral method to the parametrization of boundary layer profiles and calcualtion of wall heat transfer is established. A mixing-length type turbulence model for flow on rough wall is developed and validated by comparison with experimental data. The turbulence model is used in a quasi-three-dimensional boundary layer model to evaluate the influence of wall roughness and pressure gradients on the flow characteristics and performance of MHD channels. The behaviors of skin friction and Stanton number calculated from the analytical model are found to differ considerably from the empirical correlations valid for non-MHD flows without pressure gradients. DOE

N80-26167# Argonne National Lab., Ill.
POWER TAKE-OFF ANALYSIS FOR DIAGONALLY CONNECTED MHD CHANNELS
Yen-Cheng Pan and Ezzat D. Doss 1980 13 p refs Presented at 18th AIAA Aerospace Sci. Meeting, Pasadena, Calif., 14-16 Jan. 1980
(Contract W-31-109-eng-38)
(CONF-800104-6) Avail: NTIS HC A02/MF A01

The electrical loading of the power take-off region of diagonally connected MHD channels is investigated by a two dimensional model. The loading schemes typical of those proposed for the U-25 and U-25 Bypass channels are examined. The model is applicable for the following four cases: (1) connection with diodes only, (2) connection with diodes and equal resistors, (3) connection with diodes and variable resistances to obtain a given current distribution, and (4) connection with diodes and variable resistors under changing load. The analysis is applicable for the power take-off regions of single or multiple-output systems. The general behaviors of the current and the potential distributions in all four cases are discussed. The analytical results are in good agreement with the experimental data. It is found possible to design the electrical circuit of the channel in the take-off region so as to achieve a fairly even load current output under changing total load current. DOE

N80-26168# TRW Defense and Space Systems Group, Redondo Beach, Calif.
MICROWAVE SCALING OF LASER PLASMA INTERACTIONS Final Report
W. F. DiVergilio, B. H. Quon, W. Gekelman, and A. Y. Wong Jan. 1980 23 p refs
(Contract DE-AC08-78DP-40067)
(DOE/DP-40067/T1) Avail: NTIS HC A02/MF A01

The limitations of previous target plasmas and the requirements for improved target plasmas are discussed. The discharge technqiues previously used in the QUIPS facility and utilizing a combination of the pulsed RF plasma production techniques with a new pulsed magnetic field technique, producing a target plasma are discussed. The latter-target plasma production technique was based on plasma production by intense, short pulse laser irradiation of a solid target. The resulting blowoff plasma expands into vacuum and, after a suitable delay time, was irradiated by a pulsed microwave beam. The blowoff plasma properties and preliminary results of microwave interaction experiments are described. DOE

N80-26169# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
AXIAL LASER HEATING OF THREE METER THETA PINCH PLASMA
A. L. Hoffman and D. D. Lowenthal Nov. 1979 46 p refs Submitted for publication
(Contracts DE-AC06-76ET-53027; EY-76-C-06-2319)
(MSNW-79-1045-5) Avail: NTIS HC A03/MF A01

The results of a four year effort on laser heating a 3 m long plasma in a fast rising solenoidal field are presented. It was found that beam trapping density minimums could be maintained for the length of the laser pulse if the plasma diameter exceeded about 1.5 cm. The erosion of the density minimum

was governed by classical diffusion processes. Three meter long plasmas in 2.6 cm bore plasma tubes could be fairly uniformly heated by 3.0 kJ of CO2 laser radiation. Best results were obtained when heating began before or during the theta pinch implosion phase and the plasma fill pressure exceeded 1.0 torr H2. Plasma line energies of about 1 kJ/m could be obtained in a magnetic field rising to 6 tesla in 4.7 microsec. DOE

N80-26170# Los Alamos Scientific Lab., N. Mex.
OPTICAL MIXING AS A PLASMA DIAGNOSTIC
Peter R. Forman and Werner Riesenfeld Mar. 1980 38 p refs
(Contract W-7405-eng-48)
(LA-8262-MS) Avail: NTIS HC A03/MF A01

The nonlinear interaction of electromagnetic waves in a plasma are examined as the basis for a new and useful diagnostic tool. In particular, the Raman-Induced Kerr effect is considered (RIKE) in a magnetic field-free plasma, the characteristics of various laser sources and detecting equipment necessary for the implementation of a sensitive RIKE scattering system are evaluated. It is concluded that the present state of technology permits the design of promising diagnostic systems of this type. Finally, reasonable conjectures are discussed on the generalization of the effect to magnetoplasmas, in which the measurement could lead to the determination not only of density, but also of the magnitude and direction of the imbedded magnetic field. DOE

N80-26171# Argonne National Lab., Ill. Fusion Power Program.
STARFIRE: A COMMERCIAL TOKAMAK REACTOR Interim Status Report, May - Sep. 1979
Dec. 1979 193 p Prepared in part by McDonnell Douglas Astronautics Co., St. Louis, Mo., General Atomic Co., San Diego, Calif., and Ralph M. Parson Co., Pasadena, Calif.
(Contract W-31-109-eng-38)
(ANL/FPP/TM-125) Avail: NTIS HC A09/MF A01

Design concepts for a commercial Tokamak fusion electric power plant based on the deuterium/tritium/lithium fuel cycle are discussed. The key technical objective is to develop the best embodiment of the Tokamak as a power reactor consistent with credible engineering solutions to design problems. Another key goal is to give careful attention to the safety and environmental features of a commercial fusion reactor. Design considerations for plasma engineering, first-wall/blanket, heat transport system, reactor facility, toroidal field coil system, and maintenance are specifically addressed. DOE

N80-26172# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
MHD HIGH PERFORMANCE DEMONSTRATION EXPERIMENT Quarterly Progress Report, 1 Apr. - 30 Jun. 1979
Jul. 1979 33 p refs
(Contract ET-78-I-01-2895)
(DOE/ET-2895/S) Avail: NTIS HC A03/MF A01

The attainment of MHD performance was demonstrated on a sufficiently large scale to verify that the projected efficiency of the commercial MHD concept is attainable. To perform the experiment, an existing facility at the Arnold Engineering Development Center (USAF) was refurbished and the new systems required for performaning the experiment were designed and built. In particular, the largest systems which have required the greatest expenditure of resources are the generator channel and the 6 Tesla (T) cryogenically cooled magnet. The pressure testing of the generator channel was completed and the channel was installed in the magnet to facilitate final alignment of the burner. The diffuser assembly operations were completed. The magnet was retested in the warm mode. No problems were encountered in the latest tests and the magnet was subsequently cooled to 165 K and pulsed to a peak field strength of 2.9T. DOE

N80-26173# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France).
CONTRIBUTION TO THE STUDY OF ELECTROSTATIC AND ELECTROMAGNETIC WAVES NEAR THE LOWER HYBRID FREQUENCY IN IONOSPHERIC PLASMA Ph.D. Thesis - Orleans Univ. [CONTRIBUTION A L'ETUDE DES ONDES ELECTROSTATIQUES ET ELECTROMAGNETIQUES AU VOISINAGE DE LA FREQUENCE HYBRIDE BASSE DANS LE PLASMA IONOSPHERIQUE]
Michel Hamelin 1978 152 p refs In FRENCH
(CRPE-NT-61) Avail: NTIS HC A08/MF A01

Wave dispersion near the lower hybrid frequency in a homogeneous plasma with several ionic types was studied. The different macroscopic theories were reviewed: cold pasma theory; adiabatic theory in electrostatic approximation; and complete adiabatic theory. Electrostatic waves in perpendicular propagation and in quasiperpendicular propagation were examined. A complete study of electromagnetic and electrostatic wave progation in a weakly inhomogenous environment near the lower hybrid frequency is exposed in the frame of the adiabatic theory. The response to a point source electric impulse in a homogenous environment was investigated with reference to moving plasma. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N80-26174 Maine Univ., Orono.
SPECTRUM OF ACOUSTIC WAVES EXCITED IN SINGLE AND MULTIPLE LAYERED CRYSTALLINE MEDIA Ph.D. Thesis
Ashok Jhunjhunwala 1979 265 p
Avail: Univ. Microfilms Order No. 8013249

Acoustic waves in various crystallographic orientations and materials are studied for eventual use in microwave acoustic devices. In particular, the acoustic waves propagating in a source-free multiple layered crystalline media and the spectrum of acoustic waves excited by an interdigital transducer (IDT) in a piezoelectric half space are theoretically studied. Properties such as the wave velocity, coupling coefficient, temperature coefficient of delay and/or velocity, power flow angles, and diffraction profiles associated with these waves are predicted. Computer programs are developed which calculate properties for these waves for various materials and orientations. The surface acoustic wave (SAW) and pseudo SAW properties of a new material, Fresnoite (Ba2Si2Ti08) and of BSO (Bi12Si020) using the measured piezoelectric constants are guided. Fresnoite is found to have potential applications in convolvers and BSO has potential applications in long delay lines. Surface wave properties are studied for a fused Quartz layer over a LiNbO3 substrate and are found to have both temperature compensation and a high coupling coefficient, properties particularly attractive for device applications. The spectrum of waves excited by an IDT is evaluated for certain orientations on quartz, Berlinite, LiTaO3 and LiNbO3. Dissert. Abstr.

N80-26175 Rutgers - The State Univ., New Brunswick, N. J.
LATTICE DYNAMICS WITH SHORT-RANGE CORRELATIONS APPLIED TO TWO-PHONON RAMAN SCATTERING Ph.D. Thesis
John Granville Leese 1980 140 p
Avail: Univ. Microfilms Order No. 8013171

The lattice dynamics of heavy rare gas solids is investigated in the high temperature limit, using the Horner method of including short range correlations and anharmonicity in self-consistent phonon theory. Short range correlations are taken into account by modifying the simple Gaussian pair correlation function employed in harmonic theories. Realistic and model potentials are used. The Horner method is found to give significantly better results than previous theories over a large temperature range. The calculated phonon frequencies and bulk properties compare favorably with experiment. These results are applied to a study of two phonon Raman scattering of light in rare gas solids, using the point-dipole model, over a wide range of temperatures and pressures. Theoretical and experimental force constants are used to compute the phonons. The calculated spectral lineshapes are in generally good agreement with experiment. However, there are some discrepancies to account for. These have to do with phonon scattering, deficiencies of the point-dipole model, contributions from ladder diagram

processes, and uncertainties in the experimental data.
Dissert. Abstr.

N80-26176 Wisconsin Univ. - Madison.
FABRICATION AND DIAGNOSTICS OF OXIDE TUNNELING BARRIERS IN NIOBIUM BASED SUPERCONDUCTIVE TUNNEL JUNCTIONS Ph.D Thesis
Pramod Chintaman Karulkar 1979 260 p
Avail: Univ. Microfilms Order No. 8008822

Different oxide barrier formation techniques (thermal, dc glow discharge, and RF glow discharge) used in fabrication of niobium based superconductive tunnel junctions are examined. Fabrication and electrical testing of Nb-Nb oxide-Pb junctions and X-ray photoelectron and Auger electron spectroscopic analysis of the very thin niobium oxide films used as the tunneling barriers in well characterized junctions is discussed. A qualitative description of different processes taking place in the low voltage RF glow discharge oxidation is given. The RF glow discharge oxidation offered better control and yield than thermal of dc glow discharge oxidation procedures. The effect of argon ion bombardment on the compositions of NbO, NbO2 and Nb2O5 is examined. Preferential sputtering of oxygen from the surfaces of these oxides was observed. An X-ray photoelectron spectroscopic study of thin oxide films showed that large leakage currents in Nb based junctions are associated with the presence of niobium suboxides in the tunneling barrier. A comparative study of oxide barriers formed by dc glow discharge RF glow discharge, and thermal oxidation techniques led to the conclusion that the oxide films produced by RF glow discharge oxidation exhibit lower tunneling resistance.
Dissert. Abstr.

N80-26177# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FORMATION AND TRANSFORMATION OF POLYTYPES IN MX2 COMPOUNDS
V. K. Agrawal May 1980 12 p refs Proposed for presentation at 6th Intern. Conf. on Crystal Growth, Moscow, 10-16 Sep. 1980 Revised
(INPE-1735-RPE/135) Avail: NTIS HC A02/MF A01

On the basis of a review of experimental studies made on single crystals of PbI2, CdI2 and CdBr2, it is shown that the high polytypes in a substance are formed as a matter of chance in the initial stages of the growth of crystals and they are in the metastable state, therefore, transform generally into a basic type during growth/on annealing. As regards to formation of a basic type, the ionicity of the compound is found to have a direct influence in determining which of the closely related structures should be formed. On the basis of polytypic structures of CdI2 and PbI2, it is found that the second and third neighbors anion-anion layer interactions dominate the interlayer interactions during growth/transformation of polytypes. A criterion for the occurrence of Zhdanov number 3 in Zhdanov symbols of a crystal structure (only at places where the sum of the numbers occurring before it is an odd number) is evolved which would help in the determination of structures of high polytypes of CdI2 and PbI2.
M.G.

N80-26178# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A CALCULATION OF THE PRESSURE DEPENDENT ENERGY BANDS OF CuCl
Paulo S. Guimaraes and Nelson de Jesus Parada Jan. 1980 19 p refs Revised
(INPE-1674-RPE/109) Avail: NTIS HC A02/MF A01

The calculation of the energy bands of CuCl by the cluster method is presented. Several clusters were used, all giving the same results. The calculated energy bands coincide with the known experimental facts on CuCl. The calculated bands present a sudden change at 40 kbar, very suggestive of the transition that CuCl undergoes at such pressures.
Author

N80-26179# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
RADIATIVE AND NONRADIATIVE RECOMBINATION TIMES IN SEMICONDUCTING FILMS
M. T. Pacheco Feb. 1980 24 p refs Revised Submitted for publication
(INPE-1679-RPE/112) Avail: NTIS HC A02/MF A01

The dependence of the fluorescence lifetime upon the thickness of active thin films is discussed. For systems in which the radiative recombination rate is dominant over the nonradiative ones, the total recombination time can be changed by suitable modifications of the film thickness. In this situation the nonradiative rate can be evaluated. Experimental results for the case of cadmium sulfide thin films are presented.
E.D.K.

N80-26180# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
ROLES OF THE LOWER AND UPPER HUBBARD BANDS AND THE DONOR-EXCITONIC STATES IN THE THEORY OF SHALLOW IMPURITY STATES IN DOPED SEMICONDUCTORS
K. A. Chao, R. Riklund, and A. Ferreira DaSilva Feb. 1980 20 p refs Revised Submitted for publication
(INPE-1684-RPE/115) Avail: NTIS HC A02/MF A01

A self consistent unrestricted Hartree Fock pseudo-cluster calculation was performed to investigate the roles of various bands in doped semiconductors. While the lower and the upper Hubbard bands are well defined at low concentration, the donor excitonic states are important at higher concentration where the upper Hubbard band is pushed into the conduction band. The so modified MHA model can still explain almost all the experimental results.
J.M.S.

N80-26181*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
SOLID STATE CRYSTAL PHYSICS AT VERY LOW TEMPERATURES Annual Report
W. Davis, K. Krack, J. P. Richard, and J. Weber Apr. 1980 38 p
(Grant NsG-7196)
(NASA-CR-163240) Avail: NTIS HC A03/MF A01 CSCL 20L

The properties of nearly perfect crystals was studied at cryogenic temperatures. A large Helium 3 and Helium 4 dilution refrigerator has been assembled, and is described. A cryostat suitable for cooling a 35 liter volume to .020 Kelvin was designed and constructed, together with instrumentation to observe the properties of nearly perfect crystals.
E.J.R.

N80-26182*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE PLANAR MULTIJUNCTION CELL: A NEW SOLAR CELL FOR EARTH AND SPACE
John C. Evans, An-Ti Chai, and Chandra Goradia 1980 8 p refs Proposed for presentation at 15th Intern. Energy Conversion Engr. Conf., Seattle, Wash., 18-22 Aug. 1980; sponsored by AIAA, presented at 14th IEEE Photovoltaic Specialists Conf., San Diego, Calif., 7-10 Jan. 1980
(NASA-TM-81526) Avail: NTIS HC A02/MF A01 CSCL 20L

A family of high-voltage solar cells, called the planar multijunction (PMJ) cell is being developed. The new cells combine the attractive features of planar cells with conventional or interdigitated back contacts and the vertical multijunction solar cell. The PMJ solar cell is internally divided into many voltage-generating regions, called unit cells, which are internally connected in series. The key to obtaining reasonable performance from this device was the separation of top surface field regions over each active unit cell area. Using existing solar cell fabricating methods, output voltages in excess of 20 volts per linear centimeter are possible. Analysis of the new device is complex, and numerous geometries are being studied which should provide substantial benefits in both normal sunlight usage as well as with concentrators.
Author

N80-26183# Rome Air Development Center, Griffiss AFB, N.Y.
SINGLE CRYSTAL GROWTH OF ZIRCONIA UTILIZING A SKULL MELTING TECHNIQUE
R. C. Marshall and J. A. Adamski Aug. 1979 26 p refs
(AF Proj. 2306)
(AD-A082323; RADC-TR-79-227) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report reviews the problems associated with the high temperature growth of non-metallic single crystals, particularly refractory oxides. Various approaches to circumvent the problems of melt contamination and containment are discussed. The cold wall R.F. heated skull technique is discussed in detail. This

technique is applied to the growth of yttria stabilized zirconia to meet specific requirements, and to establish the viability of this technique. The resulting crystals are characterized by a number of optical, chemical, and physical techniques. GRA

N80-26184# Los Alamos Scientific Lab., N. Mex.
ELECTRONIC STRUCTURE, BONDING AND CHEMISORPTION IN METALLIC HYDRIDES
John W. Ward 1980 19 p refs Presented at Intern. Symp. on the Properties and Appl. of Metal Hydrides, Colorado Springs, Colo., 7-11 Apr. 1980 Submitted for publication
(Contract W-7405-eng-36)
(LA-UR-80-458; CONF-800402-8) Avail: NTIS HC A02/MF A01

Problems that can arise during the cycling steps for a hydride storage system usually involve events at surfaces. A unifying concept is offered, which satisfactorily correlates many of the properties of transition-metal, rare-earth and actinide hydrides. The metallic hydrides can be differentiated on the basis of electronegativity, metallic radius (valence) and electronic structure. For those systems where there are d (transition metals) or f (early actinides) electrons near the Fermi level a broad range of chemical and catalytic behaviors are found, depending on band-width and energy. The more electropositive metals (rare-earth, actinides, transition metals with d < 5) tend to strongly chemisorb electrophilic molecules; this is a consequence of the manner in which new bonding states are introduced. More electronegative metals (d > 5) dissolve hydrogen and form hydrides by an electronically somewhat different process, and as a class tend to adsorb electrophobic molecules. DOE

N80-26185# Brookhaven National Lab., Upton, N. Y. Physics Dept.
MONTE CARLO SIMULATIONS OF LATTICE GAUGE THEORIES
C. Rebbi Feb. 1980 23 p refs Presented at Lecture on Common Trends in Particle and Condensed Matter Phys. Les Houches, France, 1980
(Contract EY-76-C-02-0016; DE-AC02-76CH-00016)
(BNL-27323) Avail: NTIS HC A02/MF A01

Monte Carlo simulations done for four dimensional lattice gauge systems are described, where the gauge group is one of the following U(1);SU(2); Z sub N, i.e., the subgroup of U(±) consisting of the elements e2 in/N with integer n and N; the eight element group of quaternions, Q; the 24 and 48 element subgroups of SU(2), denoted by T and O, which reduce to the rotation groups of the tetrahedron and the octahedron when their centers Z2, are factored out. All of these groups can be considered subgroups of SU(2) and a common normalization was used for the action. The following types of Monte Carlo experiments are considered; simulations of a thermal cycle, where the temperature of the system is varied slightly every few Monte Carlo iterations and the internal energy is measured; mixed-phase runs, where several Monte Carlo iterations are done at a few temperatures near a phase transition starting with a lattice which is half ordered and half disordered; measurements of averages of Wilson factors for loops of different shape. DOE

N80-26186# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CHEMISORPTION AND REACTIVITY STUDIES OF SMALL MOLECULES ON RHODIUM SURFACES Ph.D. Thesis
David G. Castner Sep. 1979 211 p refs
(Contract W-7405-eng-48)
(LBL-9471) Avail: NTIS HC A10/MF A01

The chemisorption of H2, O2, CO, CO2, NO, C2H2, C2H4, and C on clean Rh(111), (100), (755), and (331) surfaces is studied. Low energy electron diffraction, Auger electron spectroscopy, and desorption mass spectroscopy were used to determine the size and orientation of the unit cells, desorption temperatures, and decomposition characteristics for each adsorbate. All of the molecules readily chemisorbed on all surfaces and several ordered surface structures were observed. DOE

N80-26187# National Bureau of Standards, Washington, D.C.
POLARIZED LEED STUDY OF SURFACE MAGNETISM
D. T. Pierce, R. J. Celotta, G. C. Wang, G. P. Felcher, S. D. Bader, and K. Miyano 1979 11 p refs Presented at the Intern. Conf. on Magnetism, Munich, 3-7 Sep. 1979 Prepared in cooperation with Argonne Natl. Lab., Ill.
(Contract W-31-109-eng-38)
(CONF-790909-15) Avail: NTIS HC A02/MF A01

The surface magnetization of ferromagnetic Ni(110) was observed via the use of a spin polarized electron beam. The spin dependence of the scattered electron intensity was measured as a function of external magnetic field strength and temperature. DOE

N80-26188# Sandia Labs., Albuquerque, N. Mex.
CROSS SECTIONS FOR ELECTRON AND PHOTON PROCESSES REQUIRED BY ELECTRON-TRANSPORT CALCULATIONS
James M. Peek Nov. 1979 121 p refs
(Contract EY-76-C-04-0789; DE-AC04-76DP-00789)
(SAND-79-0772) Avail: NTIS HC A06/MF A01

Electron transport calculations rely on a large collection of electron-atom and photon-atom cross section data to represent the response characteristics of the target medium. These basic atomic-physics quantities and certain qualities derived from them that are now commonly in use, are critically reviewed. Cases for which data improvements can be made from existing information are identified. Ranges of parameters for which state-of-the-art data are not available are sought out, and recommendations for explicit measurements and/or calculations with presently available tools are presented. An attempt is made to identify the maturity of the atomic-physics data and to predict the possibilities for rapid changes in the quality of the data. Finally, weaknesses in the state-of-the-art atomic-physics data and in the conceptual usage of these data in the context of electron transport theory are discussed. Brief attempts are made to weigh the various aspects of these questions and to suggest possible remedies. DOE

N80-26189# National Technical Information Service, Springfield, Va.
GALLIUM ARSENIDE EPITAXIAL GROWTH, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Feb. 1980
Brian Carrigan Mar. 1980 236 p Supersedes NTIS/PS-79/0213; NTIS/PS-78/0227 and NTIS/PS-77/0139
(PB80-805583; NTIS/PS-79/0213; NTIS/PS-78/0227; NTIS/PS-77/0139) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 20L

Research abstracts on GaAs epitaxial growth in liquid and vapor phases are included in this bibliography. Techniques, tests, physical properties, crystal structure, and doping are described. The use of gallium arsenide in optical modulators, fiber optics, semiconductor diodes, and microwave equipment is cited. This updated bibliography contains 229 abstracts, 45 of which are new entries to the previous edition. GRA

N80-26190# National Technical Information Service, Springfield, Va.
GALLIUM ARSENIDE EPITAXIAL GROWTH, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - Feb. 1980
Brian Carrigan Mar. 1980 250 p Supersedes NTIS/PS-79/0215; NTIS/PS-78/0228 and NTIS/PS-77/0141
(PB80-805591; NTIS/PS-79/0215; NTIS/PS-78/0228; NTIS/PS-77/0141) Copyright. Avail: NTIS HC $30.00/MF $30.00 CSCL 20L

Citations from worldwide research journals on gallium arsenide vapor and liquid phase and molecular beam epitaxial growth are presented. Crystal structure and physical properties of epitaxial gallium arsenide are included, as are studies on doping effects, defects, and semiconductor devices. This updated bibliography contains 243 abstracts, 75 of which are new entries to the previous edition. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N80-26191# Los Alamos Scientific Lab., N. Mex.
RENORMALIZING THE STRONG-COUPLING EXPANSION FOR QUANTUM FIELD THEORY: PRESENT STATUS
Fred Cooper, David Sharp, Carl M. Bender (Washington Univ., St. Louis, Mo.), G. S. Guralnik (Brown Univ.), and Ralph Roskies (Pittsburgh Univ.) 1980 33 p refs Presented at Orbis Scientiae, Coral Gables, Fla., 14 Jan. 1980
(Contract W-7405-eng-36)
(LA-UR-80-482; CONF-800123-2) Avail: NTIS HC A03/MF A01

The lattice version of the path integral representation for the Green's functions with restrictions to lambda phi 4 field theory in d dimensions was examined. The unrenormalized strong coupling expansion on the lattice was determined. This was a series in a dimensionless parameter, x. A simple set of graphical rules for determining the Green's functions of the theory in a power series in x was derived. For finite field theories d < 2 scheme for extrapolating the zero lattice spacing (a yields 0) was presented. This scheme determines a sequence of approximants to the unrenormalized strong coupling series in the form of a series. The lattice field theory consists of eliminating x in favor of y, a renormalized x. For d < 2, M sub r squared = 0 occured when M sub O yields infinity, where M sub R is the renormalized mass and M sub O is the bare mass. The path integral was dominated by instantons. The renormalized strong coupling expansion was valid for the double well where M sub R square is < < lamba sup 2 (4d). DOE

N80-26192# National Technical Information Service, Springfield, Va.
RELATIVITY THEORY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1970 - Feb. 1980
Brian Carrigan Mar. 1980 209 p Supersedes NTIS/PS-79/0183; NTIS/PS-78/0253; NTIS/PS-77/0201
(PB80-805542; NTIS/PS-79/0183; NTIS/PS-78/0253; NTIS/PS-77/0201) Avail: NTIS HC $30.00/MF $30.00 CSCL 20J

Research studies are presented on special and general relativity. Gravitational theory, field theory, and space-time studies are included, as are studies involving Minkowski space, the Dirac equation, and Lorentz transformations. This updated bibliography contains 202 abstracts, 9 of which are new entries to the previous edition. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

No abstracts in this category.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N80-26193* National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
TECHNICAL PUBLICATIONS OF THE NASA-WALLOPS FLIGHT CENTER, 1973 - 1979
J. N. Foster, comp. May 1980 76 p
(NASA-TM-73285) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 05B

This bibliography lists approximately 500 publications sponsored by the NASA Wallops Flight Center during the period 1973 through 1979. The compilation contains citations listed by type of publication (i.e., formal report, contractor report, journal article, or presentation); contract/grant number; and accession number. E.J.R.

N80-26194# Illinois Univ. at Urbana-Champaign. Coordinated Science Lab.
BROWSING IN LARGE DATA BASES
Douglas D. Dankel, II Feb. 1979 25 p refs
(Contract N00014-75-C-0612)
(AD-A081987; WP-17) Avail: NTIS HC A02/MF A01 CSCL 09/2

The formation of data bases containing information on mechanical systems for trouble shooting purposes has become increasingly popular and important. Examination of these data bases by humans can be very costly. A system called BROWSER is currently under development to heuristically search a data base containing information on Navy aircraft with little or no human intervention. BROWSER searches the data base guided by models and heuristics looking for interesting patterns or configurations. The user is then notified of the existance of these patterns. GRA

N80-26195# Control Data Corp., St. Paul, Minn.
APPLICATIONS OF A RECONFIGURABLE ARRAY OF FLEXIBLE PROCESSORS IN INTELLIGENCE INFORMATION RETRIEVAL Final Report, Jan. 1978 - Apr. 1979
Walling R. Cyre Griffiss AFB, N.Y. RADC Dec. 1979 119 p
(Contract F30602-78-C-0065; AF Proj. 4594)
(AD-A082324; RADC-TR-79-313) Avail: NTIS HC A06/MF A01 CSCL 09/2

The objective of this study was to investigate the applicability of a Reconfigurable Array of Flexible Processors, with enhanced word processing capabilities, to the problem of document retrieval. The work performed during the study falls into three categories. First, the intelligence information retrieval application at AFSC Foreign Technology Division (FTD), Wright-Patterson AFB, Ohio was analyzed for characteristics which might serve as system design and performance evaluation measures. The analysis was conducted by reviewing the data base and system usage characteristics at FTD and by synthesizing and analyzing a small experimental data base. From this, several areas in which the Reconfigurable Array with an associative processing unit might be used to advantage were identified, and a number of system sizing parameters were found. The second category of work included the design modification and fabrication of an exploratory model of an associative unit, and its integration with a laboratory Reconfigurable Array. The third category of effort included the development and exercising of a demonstration document retrieval system using a Reconfigurable Array of Flexible Processors, the Exploratory Development Model Associative Unit, and the experimental data base. The results of the evaluations performed during the study indicate that a Reconfigurable Array with a fully populated Associative Unit should perform searches about 200 times faster than the current system. GRA

N80-26196# Kappa Systems, Inc., Arlington, Va.
CLEARINGHOUSE AND INFORMATION RESOURCES OFFERING UTILITY-RELATED PRODUCTS AND SERVICES

10 Dec. 1979 40 p
(Contract DE-RP01-79RG-10019)
(DOE/RG-10019/T1) Avail: NTIS HC A03/MF A01

This report, designed for use within the utility community, offers informative descriptions of some of the more relevant organizations engaged in providing information concerned with utility rate regulation. Eighteen information profiles are structured to include the name, address, and telephone number of each of the organizations, and where appropriate, personnel who should be contacted for assistance. A brief synopsis of relevant data indicates type of information and services available to users.
DOE

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N80-26197# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
ANALYSIS OF THE UNCERTAINTIES ASSOCIATED WITH COST ESTIMATION M.S. Thesis [ANALISE DA INCERTEZA ASSOCIADA A ESTIMACAO DE CUSTOS]
Luiz Antonio Nogueira Lorena Mar. 1980 107 p refs In PORTUGUESE; ENGLISH summary
(INPE-1692-TDL/022) Avail: NTIS HC A06/MF A01

Some cost analysis techniques are considered as an integral part of cost-effectiveness analysis. Particular emphasis is given to the application of the Delphi method and statistical methods to cost analysis. The main thrust however, is to quantify cost uncertainities, proposing its use as a decision tool. A.R.H.

N80-26198*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COST ESTIMATING RELATIONSHIPS FOR AIRFRAMES IN THE DEVELOPMENT AND PRODUCTION PHASES
Donald G. Eide Jun. 1980 50 p refs
(NASA-TM-80229; L-13297) Avail: NTIS HC A03/MF A01 CSCL 05C

Cost estimating relationships are presented along with their statistical properties for the development phase and production phase for aircraft airframe programs. These relationships were derived for the engineering, tooling, manufacturing, and materials subdivisions of work during each phase. Cost estimating relationships are also presented for development support and flight test operations during the development phase. The purposes of the separation of costs by phase and by subdivision of work are to obtain better discounted dollar comparisons of different aircraft vehicles, to estimate the costs of vehicle programs with limited production requirements, and to evaluate the impact of technology advances affecting different subdivisions of work in different phases of the vehicle program. Author

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N80-26199# Committee on Commerce, Science, and Transportation (U. S. Senate).
AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES, PARTS 1 AND 2
Eilene Galloway Washington GPO 1980 272 p refs Rept. presented to the Comm. on Com., Sci., and Transportation, 96th Congr., 2nd Sess., May 1980
(GPO-59-896) Avail: SOD HC CSCL 05D

The history of the development of legal principles to guide the behavior of nations, international organizations, and individuals in the exploration and exploitation of celestial bodies in the solar system (other than Earth) is reviewed. Recent U.N. negotiations on the Moon agreement are summarized. A section-by-section comparative analysis with other space treaties now in force is presented along with the issues and questions raised by the analysis. The text of the agreement, those international agreements mentioned in it, and several other international documents deemed useful in understanding this proposal are included. A.R.H.

N80-26200# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
FUNDING FOR HIGHWAY SAFETY RESEARCH, DEVELOPMENT, AND DEMONSTRATION IN THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION Final Report, Jul. 1978 - Nov. 1979
Thomas C. Anderson Nov. 1979 132 p refs Sponsored by Motor Vehicle Manufacturing Assoc.
(PB80-137672; UM-HSRI-79-88) Avail: NTIS HC A07/MF A01 CSCL 05A

The National Highway Traffic Safety Administration's (NHTSA) allocation of resources to highway safety research, development, and demonstration programs is examined for the 1970-1979 time period, and additional analysis is made of the allocation of 403 contract expenditures in NHTSA's proposed 1980-1984 plan. GRA

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N80-26201*# Minicars, Inc., Goleta, Calif.
NEAR HYBRID PASSENGER VEHICLE DEVELOPMENT PROGRAM, PHASE 1. APPENDICES A AND B. MISSION ANALYSIS AND PERFORMANCE SPECIFICATION STUDIES REPORT, VOLUME 1
Oct. 1979 468 p Revised Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-163330; JPL-9950-37) Avail: NTIS HC A20/MF A01 CSCL 13F

The three most promising vehicle use patterns (missions) for the near term electric hybrid vehicle were found to be all-purpose city driving, commuting, and family and civic business. The mission selection process was based principally on an analysis of the travel patterns found in the Nationwide Transportation Survey and on the Los Angeles and Washington, D.C. origin-destination studies data. Travel patterns in turn were converted to fuel requirements for 1985 conventional and hybrid cars. By this means, the potential fuel savings for each mission were estimated, and preliminary design requirements for hybrid vehicles were derived. A.R.H.

N80-26202*# Minicars, Inc., Goleta, Calif.
NEAR HYBRID PASSENGER VEHICLE DEVELOPMENT PROGRAM, PHASE 1. APPENDICES C AND D, VOLUME 2 Final Report
Oct. 1979 352 p Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-163331; JPL-9950-337; FR-4500-09-79-11) Avail: NTIS HC A16/MF A01 CSCL 13F

Results of tradeoff studies are presented in summary form. Various aspects of the overall vehicle design discussed include selection of the base vehicle, the battery pack configuration, structural modifications, occupant protection, vehicle dynamics, and aerodynamics. The drivetrain design and integration, power conditioning unit, battery subsystem, control system, environmental system are described. Specifications, weight breakdown, and energy consumption measures, and advanced technology components are included. A.R.H.

N80-26203*# General Electric Co., Schenectady, N. Y.
NEAR-TERM HYBRID VEHICLE PROGRAM, PHASE 1. APPENDIX B: DESIGN TRADE-OFF STUDIES Final Report

8 Oct. 1979 204 p refs Prepared for JPL
(Contract JPL-955190)
(NASA-CR-163227; SRD-79-134/3-App-B-Vol-1;
JPL-9950-334-App-B-Vol-1) Avail: NTIS HC A10/MF A01
CSCL 13F

The relative attractiveness of various hybrid/electric power train configurations and electrical and mechanical drive-line components was studied. The initial screening was concerned primarily with total vehicle weight and economic factors and identified the hybrid power train combinations which warranted detailed evaluation over various driving cycles. This was done using a second-by-second vehicle simulation program which permitted the calculations of fuel economy, electricity usage, and emissions as a function of distance traveled in urban and highway driving. Power train arrangement possibilities were examined in terms of their effect on vehicle handling, safety, serviceability, and passenger comfort. A dc electric drive system utilizing a separately excited motor with field control and battery switching was selected for the near term hybrid vehicle. Hybrid vehicle simulations showed that for the first 30 mi (the electric range of the vehicle) in urban driving, the fuel economy was 80 mpg using a gasoline engine and 100 mpg using a diesel engine. In urban driving the hybrid would save about 75% of the fuel used by the conventional vehicle and in combined urban/highway driving the fuel saving is about 50%. J.M.S.

N80-26204*# General Electric Co., Schenectady, N. Y.
NEAR-TERM HYBRID VEHICLE PROGRAM, PHASE 1. APPENDIX B: DESIGN TRADE-OFF STUDIES REPORT. VOLUME 2: SUPPLEMENT TO DESIGN TRADE-OFF STUDIES Final Report
8 Oct. 1979 319 p refs Prepared for JPL
(Contract JPL-955190)
(NASA-CR-163228; SRD-79-134/4-App-B-Vol-2;
JPL-9950-334-App-B-Vol-2) Avail: NTIS HC A14/MF A01
CSCL 13F

Results of studies leading to the preliminary design of a hybrid passenger vehicle which is projected to have the maximum potential for reducing petroleum consumption in the near term are presented. Heat engine/electric hybrid vehicle tradeoffs, assessment of battery power source, and weight and cost analysis of key components are among the topics covered. Performance of auxiliary equipment, such as power steering, power brakes, air conditioning, lighting and electrical accessories, heating and ventilation is discussed along with the selection of preferred passenger compartment heating procedure for the hybrid vehicle. Waste heat from the engine, thermal energy storage, and an auxiliary burner are among the approaches considered. J.M.S.

N80-26205*# General Electric Co., Schenectady, N. Y.
NEAR-TERM HYBRID VEHICLE PROGRAM, PHASE 1. APPENDIX B: DESIGN TRADE-OFF STUDIES REPORT. VOLUME 3: COMPUTER PROGRAM LISTINGS Final Report
8 Oct. 1979 115 p Prepared for JPL
(Contract JPL-955190)
(NASA-CR-163229; SRD-79-134/5-App-B-Vol-3;
JPL-9950-334-App-B-Vol-3) Avail: NTIS HC A06/MF A01
CSCL 13F

A description and listing is presented of two computer programs: Hybrid Vehicle Design Program (HYVELD) and Hybrid Vehicle Simulation Program (HYVEC). Both of the programs are modifications and extensions of similar programs developed as part of the Electric and Hybrid Vehicle System Research and Development Project. J.M.S.

N80-26206*# General Electric Co., Schenectady, N. Y.
NEAR-TERM HYBRID VEHICLE PROGRAM, PHASE 1 Final Report
8 Oct. 1979 146 p refs Prepared for JPL
(Contract JPL-955190)
(NASA-CR-163230; SRD-79-134/1; JPL-9950-334) Avail:
NTIS HC A07/MF A01 CSCL 13F

The preliminary design of a hybrid vehicle which fully meets or exceeds the requirements set forth in the Near Term Hybrid Vehicle Program is documented. Topics addressed include the general layout and styling, the power train specifications with discussion of each major component, vehicle weight and weight breakdown, vehicle performance, measures of energy consumption, and initial cost and ownership cost. Alternative design options considered and their relationship to the design adopted, computer simulation used, and maintenance and reliability considerations are also discussed. J.M.S.

N80-26207*# General Electric Co., Schenectady, N. Y.
NEAR-TERM HYBRID VEHICLE PROGRAM, PHASE 1. APPENDIX A: MISSION ANALYSIS AND PERFORMANCE SPECIFICATION STUDIES REPORT Final Report
8 Oct. 1979 136 p refs Prepared for JPL Original contains color illustrations
(Contract JPL-955190)
(NASA-CR-163231; SRD-79-134/2-App-A;
JPL-9950-334-App-A) Avail: NTIS HC A07/MF A01 CSCL 13F

Results of a study leading to the preliminary design of a five passenger hybrid vehicle utilizing two energy sources (electricity and gasoline/diesel fuel) to minimize petroleum usage on a fleet basis are presented. The study methodology is described. Vehicle characterizations, the mission description, characterization, and impact on potential sales, and the rationale for the selection of the reference internal combustion engine vehicle are presented. Conclusions and recommendations of the mission analysis and performance specification report are included. J.M.S.

N80-26208*# General Electric Co., Schenectady, N. Y.
NEAR-TERM HYBRID VEHICLE PROGRAM, PHASE 1. APPENDIX C: PRELIMINARY DESIGN DATA PACKAGE Final Report
8 Oct. 1979 208 p Prepared for JPL
(Contract JPL-955190)
(NASA-CR-163232; SRD-79-134/6-App-C;
JPL-9950-334-App-C) Avail: NTIS HC A10/MF A01 CSCL 13F

The design methodology, the design decision rationale, the vehicle preliminary design summary, and the advanced technology developments are presented. The detailed vehicle design, the vehicle ride and handling and front structural crashworthiness analysis, the microcomputer control of the propulsion system, the design study of the battery switching circuit, the field chopper, and the battery charger, and the recent program refinements and computer results are presented. J.M.S.

N80-26209*# General Electric Co., Schenectady, N. Y.
NEAR-TERM HYBRID VEHICLE PROGRAM, PHASE 1. APPENDIX D: SENSITIVITY ANALYSIS RESPORT Final Report
8 Oct. 1979 55 p refs Prepared for JPL
(Contract JPL-955190)
(NASA-CR-163233; SRD-79-134/7-App-D;
JPL-9950-334-App-D) Avail: NTIS HC A04/MF A01 CSCL 13F

Parametric analyses, using a hybrid vehicle synthesis and economics program (HYVELD) are described investigating the sensitivity of hybrid vehicle cost, fuel usage, utility, and marketability to changes in travel statistics, energy costs, vehicle lifetime and maintenance, owner use patterns, internal combustion engine (ICE) reference vehicle fuel economy, and drive-line component costs and type. The lowest initial cost of the hybrid vehicle would be $1200 to $1500 higher than that of the conventional vehicle. For nominal energy costs ($1.00/gal for gasoline and 4.2 cents/kWh for electricity), the ownership cost of the hybrid vehicle is projected to be 0.5 to 1.0 cents/mi less than the conventional ICE vehicle. To attain this ownership cost differential, the lifetime of the hybrid vehicle must be extended to 12 years and its maintenance cost reduced by 25 percent compared with the conventional vehicle. The ownership cost advantage of the hybrid vehicle increases rapidly as the price of fuel increases from $1 to $2/gal. M.G.

N80-26210*# Minicars, Inc., Goleta, Calif.
NEAR TERM HYBRID PASSENGER VEHICLE DEVELOPMENT PROGRAM, PHASE 1 Final Report
Jan. 1980 144 p refs Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-955188)

(NASA-CR-163235; JPL-9950-337; FR-4500-01-80) Avail: NTIS HC A07/MF A01 CSCL 13F

Missions for hybrid vehicles that promise to yield high petroleum impact were identified and a preliminary design, was developed that satisfies the mission requirements and performance specifications. Technologies that are critical to successful vehicle design, development and fabrication were determined. Trade-off studies to maximize fuel savings were used to develop initial design specifications of the near term hybrid vehicle. Various designs were 'driven' through detailed computer simulations which calculate the petroleum consumption in standard driving cycles, the petroleum and electricity consumptions over the specified missions, and the vehicle's life cycle costs over a 10 year vehicle lifetime. Particular attention was given to the selection of the electric motor, heat engine, drivetrain, battery pack and control system. The preliminary design reflects a modified current compact car powered by a currently available turbocharged diesel engine and a 24 kW (peak) compound dc electric motor. A.R.H.

N80-26211# Fiat Research Center, Turin, Italy.
ELECTROCHEMICAL ENERGY STORAGE ON BOARD OF ROAD ELECTRIC VEHICLES
P. Montalenti, G. Brusaglino, M. Marchetto (Fabrica Italiana Magneti, Marelli), and M. Maja (Inst. di Elettrochimica del Politecnico di Torino) 1979 11 p refs Presented at Intern. Assembly on Energy Storage, Dubrovnik, Yugoslavia, 27 May - 1 Jun. 1979
Avail: NTIS HC A02/MF A01

The use of batteries to power electric vehicles is evaluated in terms of accelerations and maximum speed. A kaline, lead/acid, and high energy density batteries are analyzed for lifetime cycles, weight range, and power density. It is concluded that the lead/acid and Ni/Cd batteries are suitable for immediate application, but improvement in lifetime and reliability for economy is recommended. Future configurations of the Ni/Fe and Ni/Zn batteries will open the market to urban, suburban and commercial transportation. F.O.S.

N80-26212*# AiResearch Mfg. Co., Torrance, Calif.
ADVANCED PROPULSION SYSTEM FOR HYBRID VEHICLES Final Report
L. V. Norrup and A. T. Lintz Jan. 1980 213 p refs
(Contracts DEN3-91; EC-77-A-31-1044)
(NASA-CR-159771; DOE/NASA/0091-80/1; AiResearch-79-16430) Avail: NTIS HC A10/MF A01 CSCL 13F

A number of hybrid propulsion systems were evaluated for application in several different vehicle sizes. A conceptual design was prepared for the most promising configuration. Various system configurations were parametrically evaluated and compared, design tradeoffs performed, and a conceptual design produced. Fifteen vehicle/propulsion systems concepts were parametrically evaluated to select two systems and one vehicle for detailed design tradeoff studies. A single hybrid propulsion system concept and vehicle (five passenger family sedan)were selected for optimization based on the results of the tradeoff studies. The final propulsion system consists of a 65 kW spark-ignition heat engine, a mechanical continuously variable traction transmission, a 20 kW permanent magnet axial-gap traction motor, a variable frequency inverter, a 386 kg lead-acid improved state-of-the-art battery, and a transaxle. The system was configured with a parallel power path between the heat engine and battery. It has two automatic operational modes: electric mode and heat engine mode. Power is always shared between the heat engine and battery during acceleration periods. In both modes, regenerative braking energy is absorbed by the battery. Author

N80-26213# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY-STORAGE SYSTEMS FOR AUTOMOBILE PROPULSION, 1979 STUDY. VOLUME 3: BATTERY/FLYWHEEL ELECTRIC VEHICLES USING ADVANCED BATTERIES
M. Schwartz 15 Dec. 1979 58 p refs
(Contract W-7405-eng-48)
(UCRL-52841-Vol-3) Avail: NTIS HC A04/MF A01

The effect of applying flywheels to electric vehicles using advanced batteries is determined. The specific energy of the batteries is maximized at the expense of peak power capability to optimize performance when used with flywheels. The characteristics of battery flywheel vehicles are determined and compared to all-battery vehicles subjected to the same range and peak power specifications. Three combinations of vehicle power and range are considered for an SAE J2279aD cycle: 0.026 kW/kg and 120 km; 0.033 kW/kg and 210 km; and 0.049 kW/kg and 400 km. The combination of 0.016 kW/kg and 80 km is used with an SAE J227aC cycle. The batteries considered are lead/acid, Ni/Fe, Ni/Zn, ZnCl2, LiAl/FeS2, Na/S(cer), and Na/S(glass). Projected improvements in batteries and flywheels are considered over the next 20 y, based on probable and optimistic performance. The results show that flywheels do not necessarily yield a saving in vehicle mass (or range increase for constant vehicle mass). DOE

N80-26214# Department of Energy, Washington, D. C. Office of Transportation Programs.
ADVANCED SUBSYSTEMS FOR PRACTICAL ELECTRIC VEHICLES. ELECTRIC AND HYBRID VEHICLE SUBSYSTEMS TECHNOLOGY DEVELOPMENT PROGRAM
Sep. 1979 25 p
(DOE/CS-0102/1) Avail: NTIS HC A02/MF A01

The Electric and Hybrid Vehicle (EHV) Subsystem Technology Program of the US Department of Energy (DOE) is charged with developing the advanced technology base, other than energy storage, necessary for practical electric and hybrid vehicles. The success of this endeavor requires close liaison and continued communication between the government, industry, and the consumer market. In addition to identifying current technology problem areas and outlining the potential solutions being pursued, it communicates to the EHV industry expected component and subsystem performance achievements to assist them in their product planning and future developmental activities. The document is also intended to serve as an avenue for obtaining additional information, as well as to describe the procedures for participating in the subsystem technology development program. For these latter purposes, appropriate contact points are identified. DOE

N80-26215# Detroit Diesel Allison, Indianapolis, Ind.
GAS TURBINE ENGINES AND TRANSMISSIONS FOR BUS DEMONSTRATION PROGRAMS Status Report, 31 Jul. - 31 Oct. 1979
D. N. Nigro Nov. 1979 6 p
(Contract EM-78-C-02-4867)
(COO-4867-05) Avail: NTIS HC A02/MF A01

The procurement and delivery of eleven GT 404-4 gas turbine engines and five HT740CT and six V730CT automatic transmissions is reported. Software items such as cost reports, technical reports, installation drawings, acceptance test data and parts lists are required by the contract. A recent decision by the DOE will modify the build configuration for the last four transit coach engines. It was decided that these engines are to be built with ceramic regenerators. DOE

N80-26216# Brookhaven National Lab., Upton, N. Y. Electrochemical Technology Group.
DEVELOPMENT OF FUEL CELL TECHNOLOGY FOR VEHICULAR APPLICATIONS Annual Report, 1 Oct. 1977 - 30 Sep. 1978
J. McBreen, E. J. Taylor, K. V. Kordesch, G. Kissel, F. Kulesa, and S. Srinivasan May 1979 108 p refs
(Contract EY-76-C-02-0016)
(BNL-51047) Avail: NTIS HC A06/MF A01

A survey of the present state-of-the-art of fuel cells and batteries suitable for hybrid fuel cell/battery power plants is presented. Also given are a systems study on phosphoric acid fuel cells for transportation applications and the results of an experimental study of phosphoric acid and alkaline fuel cells under conditions and intermittent operation. A review of fuel options and fuel processing for fuel cells is included. DOE

N80-26217# Operations Research, Inc., Silver Spring, Md.
RISK ASSESSMENT OF AIR VERSUS OTHER TRANSPORTATION MODES FOR EXPLOSIVES AND FLAMMABLE CRYOGENIC LIQUIDS. VOLUME 1: RISK ASSESSMENT METHOD AND RESULTS Final Report
G. Kloeber, M. Cornell, T. McNamara, and A. Moscati Dec.

1979 147 p refs 2 Vol.
(Contract DOT-RC-82036)
(PB80-138472; ORI/TR-1552-Vol-1;
DOT-RSPA-MTB-79-13-Vol-1) Avail: NTIS HC A07/MF A01
CSCL 13F

A method for assessing the comparative risks of transporting hazardous materials by alternative routes and modes is described and applied to the transport of Class A explosives and liquid hydrogen between specific origin destinations, testing the air-highway modal combination with alternative combination with alternative combinations of highway, rail, and marine modes. The risks are found to be highly route-dependent; however, for those routes selected, the air-highway modal combination showed generally lower risks. Rerouting and improvement in terminal operations show the greatest opportunity for risk reduction. GRA

N80-26218# Operations Research, Inc., Silver Spring, Md.
RISK ASSESSMENT OF AIR VERSUS OTHER TRANSPORTATION MODES FOR EXPLOSIVES AND FLAMMABLE CRYOGENIC LIQUIDS. VOLUME 2: SUPPORTING DOCUMENTATION Final Report
G. Kloeber, M. Cornell, T. McNamara, and A. Moscati Dec. 1979 419 p refs 2 Vol.
(Contract DOT-RC-82036)
(PB80-138480; ORI/TR-1552-Vol-2;
DOT-RSPA-MTB-79-14-Vol-2) Avail: NTIS HC A18/MF A01
CSCL 13F

A methodology for performing a comparative assessment of risks involved in the transport of hazardous materials over specific routes by alternative modes applied to the transport of Class A explosives between six different origin-destinations and to the transport of liquid hydrogen over six different origin-destinations. In each case the risks associated with the transport by air compared with various combinations of highway, rail, and marine modes. The risks associated with specific operational phases, with handling operations, and with demographic characteristics of specific routes are defined and quantified. GRA

N80-26219# Office of Technology Assessment, Washington, D. C.
IMPACT OF ADVANCED GROUP RAPID TRANSIT TECHNOLOGY
Jan. 1980 68 p
(PB80-153323; OTA-T-106; LC-80-600001) Avail: NTIS
HC A04/MF A01 CSCL 13B

This assessment of advanced group rapid transit (AGRT) was made in response to a request of the House Committee on Appropriations to evaluate the need for this technology and its relationship to national mass transportation goals. Increases in traffic congestion, petroleum shortages, and decreasing mobility for the transit-dependent reflect a growing need for more efficient and effective transportation options. The need for further advances in automated guideway transit (AGT) technology, are examined and their potential impacts on various stakeholder groups are evaluated. GRA

N80-26220# American Association of Community and Junior Colleges, Washington, D.C.
COMMUNITY COLLEGES AND APPROPRIATE TECHNOLOGY
1979 36 p refs
(Contract NSF 79-SP-0851)
(PB80-131634) Avail: NTIS HC A03/MF A01 CSCL 05A

Appropriate technology is defined as alternate, intermediate, small-scale, light-capital, and neighborhood technology. Appropriate technology places a high priority on local needs, resources, skills, and benefits. Because of their strong community base, community colleges are in an ideal position to capitalize on this local orientation. Appropriate technology places heavy emphasis on practicality, on developing and employing useful tools to do constructive work. Some avenues for community college involvement in appropriate technology are: job training; hands-on workshops; public education; resource centers; demonstration sites; research, and appropriate technology entrepreneurship. Two strategies for launching appropriate technology programs are characterized as the add-on approach, involving tacking on individual courses of projects wherever there is a need or opportunity, and the institutional approach, entailing a far more systematic effort involving the entire college and the local community. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N80-26221 Yale Univ., New Haven, Conn.
THE DWARF SPHEROIDAL GALAXY IN DRACO Ph.D. Thesis
Peter Brailey Stetson 1979 270 p
Avail: Univ. Microfilms Order No. 8012095

The color-magnitude diagram of the dwarf spheroidal galaxy in Draco is redetermined, and forms the basis of a discussion of the evolutionary status of stars in this distant, metal-poor satellite of the Galaxy. Besides photoelectric photometry for 39 stars and precise photographic photometry for 514 stars to V approximately 21 m, membership probabilities derived from stars' relative proper motions, and a reddening determination from uvby-H beta photometry of early-type foreground stars have been obtained. The detailed spectrophotometry of Draco giants by Zinn (1978 Astrophys. J 255, 790) has also been rediscussed in the light of the new data. A new technique for deriving precise photographic magnitude indices from scans of photographic plates with a PDS microdensitometer was developed and is described. Dissert. Abstr.

N80-26222 Washington Univ., Seattle.
SHOCK-INDUCED GRAIN ALIGNMENT IN THE ORION NEBULA Ph.D. Thesis
Paul Elvin Johnson 1979 111 p
Avail: Univ. Microfilms Order No. 8013541

Infrared polarimetry of the Orion Nebula is presented including circular polarimetry of the Becklin-Neugebauer Source (BN) from 1.6 to 3.1 micrometers and linear polarimetry of the Kleinmann-Low Nebula (KL) and IRS2 at 2.2 micrometers. The ellipticity of the polarization of BN is about 10% and is approximately independent of wavelength from 1.6 to 3.4 micrometers. The three measured points in the KL nebula and IRS2 are found to have polarization position angles within 30 deg of the position angle of BN. The polarization is attributed to the effect of aligned, aspherical grains in KL. The degree of grain alignment necessary to produce the observed polarization of BN is most likely explained by the Purcell pinwheel alignment mechanism, driven by hydrogen recombination on the surface of grains. It is hypothesized that a shock provides the atomic hydrogen abundance necessary to excite this process. A comprehensive model of the wavelength and spatial dependencies of linear and circular polarization of KL and BN is developed based on the radiative transfer of infrared radiation through a centrally heated cloud of aligned dust grains. Dissert. Abstr.

N80-26223 Massachusetts Univ., Amherst.
SURFACE PHOTOMETRY OF THE COMA CLUSTER OF GALAXIES Ph.D. Thesis
John Spencer Sloan 1980 196 p
Avail: Univ. Microfilms Order No. 8012643

A large region of the Coma Cluster was studied using a photometer which can discriminate against the light of foreground stars. While able to accurately correct for contaminating starlight, the overall photometric utility of the photometer is limited by night sky variations. The total light distribution of the Coma Cluster at lambda 7150 A and lambda 8200 A is found to have an elliptical shape, the position angle of the major axis lying between 67 deg to 90 deg. The observed light distribution

is found to correlate well with the galaxy distribution. Along the major axis of the Cluster, the luminosity can be traced out over two degrees from the Cluster center. At lambda 7150A a mass-to-light ratio of 230 is found using a King model for the central region of the Cluster. Marginal evidence exists that at distances greater than 1.5 from the Cluster center along the major axis, the Cluster is redder, indicating an integrated spectra of (K1V-K7V). Dissert. Abstr.

N80-26224 Rochester Univ., N. Y.
ATMOSPHERES FOR HOT, HIGH-GRAVITY, PURE HELIUM STARS Ph.D. Thesis
Francois Wesemael 1979 414 p
Avail: Univ. Microfilms Order No. 8013877

An extensive grid is presented of pure helium stellar model atmosphere calculations for hot, high gravity stars. These models are intended to help elucidate the nature and characteristics of the progenitors of the DB white dwarfs. The surface gravity in our model grid ranges from log g = 6.0(1.0)9.0, whereas the effective temperature ranges from T = 25,000K at log g = 6.0 and 8.0 (T = 40,000K at log g = 7.0 and 9.0) up to temperatures close to the Eddington limit at each gravity. All our models assume hydrostatic equilibrium, steady state statistical equilibrium, pure helium composition, and plane-parallel geometry. Most of the models are unblanketed and in LTE, and include convective energy transport. In addition to these, smaller grids of NLTE models (assuming detailed radiative balance in the helium lines) and of LTE, helium-line blanketed models (including convective energy transport) were computed to assess the importance of these effects. For all LTE, unblanketed models, Greenstein's multichannel colors and detailed profiles are tabulated for the HeI 3889, 4026, 4387, 4438, 4471, 4713, 4921, 5015, 5047, 5876, 6678, 7065 and HeII 1085, 1640, 3203, 4340, 4542, and 4686 lines. Dissert. Abstr.

N80-26225 Boston Univ., Mass.
CALCULATIONS OF NLTE CARBON 2-4 SPECTRA IN LINE-BLANKETED MODEL ATMOSPHERES OF EARLY-TYPE STARS Ph.D. Thesis
Louis Alan York 1980 298 p
Avail: Univ. Microfilms Order No. 8013308

The interpretation of the spectra and atmospheric structure of O and B stars plays an important role in our understanding of galactic structure, the interstellar medium, and stellar structure and evolution. Until recently, analyses of O and B stars have been carried out subject to the limiting approximation of local thermodynamic equilibrium (LTE). However, since the temperature of O and B stars is high and the resulting radiation fields intense, it is expected that serious inconsistencies may arise as a result of the use of the LTE hypothesis. The basic problems in analyzing the spectra of early-type stars are discussed along with a description of earlier calculations performed to test the validity of the LTE hypothesis. The basic radiative transfer problem and the modifications necessary to allow for a partial coupling of the radiative transfer and statistical equilibrium equations via the equivalent two-level atom formalism are discussed. Also discussed is a method of including line-blanketing effects in the non-LTE calculations via weighted mean line opacities. Dissert. Abstr.

N80-26226 Washington Univ., Seattle.
AN ANALYSIS OF THE ATMOSPHERE OF THE RV TAURI STAR AC HERCULIS Ph.D. Thesis
Scott Rogers Baird 1979 294 p
Avail: Univ. Microfilms Order No. 8013486

The atmosphere of the RV Tauri variable AC Herculis was analyzed. A series of high dispersion coude spectrograms were obtained at all major phases in the star's cycle. Equivalent widths were measured for atomic and molecular lines on these plates. A grid of model atmospheres was calculated which were used to calculate theoretical line strengths that were then matched to the observations to give the effective temperatures and surface gravities of AC Her as a function of phase. The comparison of theoretical and observed line strengths was also used in abundance determinations for Fe/H, C/H, N/H, and O/H. A mysterious high redshift velocity system was found to appear for a short time during the rise from primary light minimum to primary light maximum. The lines in this system were quite numerous and roughly the same strength as those of the lower velocity systems which were presumably formed in the photosphere. This high redshift system contained lines of neutral and ionized metals, including some with lower excitation potentials around 4eV. This appears to be the first time in any star that such a velocity system has been recorded that contained metallic lines. Dissert. Abstr.

N80-26227 Washington Univ., Seattle.
PERIODIC MASS TRANSFER IN THE X-RAY BINARY SYSTEM HER X-1/HZ HER Ph.D. Thesis
Lidia Marta Crosa 1979 160 p
Avail: Univ. Microfilms Order No. 8013512

Mass transfer and accretion in the binary system HZ Her/Her X-1 is studied analyzing various absorption features in the X-ray flux curve. Pre-eclipse dips, anomalous dips, 0.3 and 0.7 orbital phase turn-ons, post-eclipse recoveries, are all seen to be aspects of only a single process of periodic mass transfer in this system. That is, one can understand quantitatively the periodicities and phases of these events in terms of an enhancement of the rate of mass events in terms of an enhancement of the rate of mass arrival at the outer boundary of the disk every 0.81 days, the circulation time of that material around the disk perimeter and the relaxation time of the scale height of that material as it joins the disk. Mass transfer episodes appear to be correlated with the periodic passage of the X-ray shadow of the tilted accretion disk over the most strongly heated portion of the face of HZ Her. The model not only explains the observed absorption features in the X-ray flux curve but predicts that no other adsorption feature should exist. In addition the model is used to construct an ephemeris of optical emission lines assuming they might be originated in the matter associated with the discrete accretion events on the disk. Dissert. Abstr.

N80-26228*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DISCOVERY OF OPTICAL EMISSION FROM THE SNR G 126.2 + 1.6
W. P. Blair (Michigan Univ.), R. P. Kirshner (Michigan Univ.), T. R. Gull, D. L. Sawyer (Wesleyan Univ.), and R. A. R. Parker (NASA, Johnson Space Center) May 1980 18 p refs
(NASA-TM-80708) Avail: NTIS HC A02/MF A01 CSCL 03A

Interference filter photographs were used to identify an arc of nebulosity that is coincident with the radio contours of the galactic supernova remnant G 126.2 + 1.6. Spectrophotometry of the filament shows that the emission line spectrum matches the spectra of other galactic supernova remnants. In particular, the arc shows the usual strong [SII], and [NII] emission lines seen in other remnants and unusually strong [OII] emission as seen in a few remnants. The spectrum can be adequately matched by a shock of velocity near 100 km/s in an interstellar cloud of density 3. If the SNR is at a distance of 4.5 kpc as indicated by the radio signal-D relation, then the observed pressure in the filament requires an initial energy near 4 x 10 to the 51st power (d/4.5 kpc) to the 3rd power ergs. A.R.H.

N80-26229*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SYNCHROTRON COOLING AND ANNIHILATION OF AN E(+)-E(-) PLASMA: THE RADIATION MECHANISM FOR THE MARCH 5, 1979 TRANSIENT
R. Ramaty, R. E. Lingenfelter (California Univ., San Diego), and R. W. Bussard Mar. 1980 21 p refs
(NASA-TM-80674) Avail: NTIS HC A02/MF A01 CSCL 03A

Positron-electron pair radiation is examined as a mechanism that could be responsible for the impulsive phase emission of the March 5, 1979 transient. Synchrotron cooling and subsequent annihilation of the pairs can account for the energy spectrum, the very high brightness, and the approximately 0.4 MeV feature observed from this transient, whose source is likely to be a neutron star in the supernova remnant N49 in the Large Magellanic Cloud. In this model, the observed radiation is produced in the skin layer of a hot, radiation dominated pair atmosphere, probably confined to the vicinity of the neutron star by a strong magnetic field. The width of this layer is only about 0.1 mm. In this layer, approximately 10 to the 12th power generations of pairs

are formed (by photon-photon collisions), cooled and annihilated during the approximately 0.15 sec duration of the impulsive phase. The very large burst energy implied by the distance of the Large Megellanic Cloud, and its very rapid release, are unsolved problems. Nonetheless, the possibility of neutron star vibrations, which could transport the energy coherently to the surface, heat the atmosphere mechanically to a hot, pair-producing temperature, and have a characteristic damping time roughly equal to the duration of the impulsive phase are addressed. E.J.R.

N80-26230*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GODDARD PROGRAM OF GAMMA RAY TRANSIENT ASTRONOMY
T. L. Cline, U. D. Desai, and B. J. Teegarden Mar. 1980 30 p refs Presented at the Symp. and Workshop on Cosmic Gamma Ray Bursts, Toulouse, France, 26 Nov. 1979 Submitted for publication
(NASA-TM-80675) Avail: NTIS HC A03/MF A01 CSCL 03A

Gamma ray burst studies are reviewed. The past results, present status and future expectations are outlined regarding endeavors using experiments on balloons, IMP-6 and -7, OGO-3, ISEE-1 and -3, Helios-2, Solar Maximum Mission, the Einstein Observatory, Solar Polar and the Gamma Ray Observatory, and with the interplanetary gamma ray burst networks, to which some of these spacecraft sensors contribute. Additional emphasis is given to the recent discovery of a new type of gamma ray transient, detected on 1979 March 5. Author

N80-26231*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATIONS OF ELECTRON GYROHARMONIC WAVES AND THE STRUCTURE OF THE IO TORUS
T. J. Birmingham, J. K. Alexander, M. D. Desch (Maryland Univ., College Park), R. F. Hubbard (JAYCOR, Alexandria, Va.), and B. M. Pedersen (Observatoire de Paris-Meudon, France) May 1980 34 p refs Submitted for publication
(NASA-TM-80696) Avail: NTIS HC A03/MF A01 CSCL 03A

Narrow-banded emissions were observed by the Planetary Radio Astronomy experiment on the Voyager 1 spacecraft as it traversed the Io plasma torus. These waves occur between harmonics of the electron gyrofrequency and are the Jovian analogue of electrostatic emissions observed and theoretically studied for the terrestrial magnetosphere. The observed frequencies always include the component near the upper hybrid resonant frequency, (fuhr) but the distribution of the other observed emissions varies in a systematic way with position in the torus. A refined model of the electron density variation, based on identification of the fuhr line, is included. Spectra of the observed waves are analyzed in terms of the linear instability of an electron distribution function consisting of isotropic cold electrons and hot losscone electrons. The positioning of the observed auxiliary harmonics with respect to fuhr is shown to be an indicator of the cold to hot temperature ratio. It is concluded that this ratio increases systematically by an overall factor of perhaps 4 or 5 between the inner and outer portions of the torus. A.R.H.

N80-26232# Los Alamos Scientific Lab., N. Mex.
LIGHT CURVE OF TYPE I SUPERNOVAE
S. A. Colgate, Albert G. Petschek (New Mexico Institute of Mining and Technol.), and John T. Kriese 1980 9 p refs Presented at Atomic Phys. and Spectry. for Supernovae Spectra, La Jolla, Calif., 10-12 Jan. 1980 Sponsored in part by NSF
(Contract W-7405-eng-36)
(LA-UR-80-463; CONF-800126-1) Avail: NTIS HC A02/MF A01

Calculations of the intermediate and late time luminosity of type I supernovae based on 100 percent efficiency for optical emission of energy deposited by the NI-56 decay chain give good agreement with observations provide m/sub/ej/v/2 = (2.2 + - 0.5) x 10 to the 17th power m. sq s/sq cm where M/sub ej/ is ejected mass and v is the expansion velocity. Account must be taken of the escape of both gamma rays and positrons. These two escape processes as well as the early luminosity peak as calculated by Colgate and McKee are all consistent with the same value of M/sub ej//sq v. DOE

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N80-26233 Iowa Univ., Iowa City.
MILLIARCSECOND STRUCTURE OF NINE COMPACT EXTRAGALACTIC SOURCES AT 1671 MHz Ph.D. Thesis
Robert Boone Phillips 1979 224 p
Avail: Univ. Microfilms Order No. 8012407

Nine compact extragalactic sources were observed interferometrically at lambda = 18 cm with baselines having fringe spacings from 0.0045 to 0.035 milliarcseconds. Four of the sources exhibit widely separated bright components reminiscent of extended double sources. The variable source NRAO 150 has complex structure extending over 0.020 milliarcseconds. The BL Lac object 0735 + 178 has compound structure at the limiting resolution of the observations in contradiction of concentric multicomponent models for this source and its flat radio spectrum. Three sources show simple, single component structure similar to several other sources at this wavelength. Morphology of the compact radio emission at lambda = 18 cm appears correlated to radio spectrum in a sense opposite to usual interpretations. Sources with simple spectra, reconcilable with a single radiating component instead showed multiple, separated components. Other sources with complex spectra showed comparatively simple radio structure. The radio emission of NRAO 150 however appears to come from at least three regions which also give rise to a complex system. Dissert. Abstr.

N80-26234 Maryland Univ., College Park.
ON THE PHYSICAL ENVIRONMENT IN GALACTIC NUCLEI
James Howard Beall 1979 191 p
Avail: Univ. Microfilms Order No. 8012653

Galactic nuclei quasars emit radiation over the entire electromagnetic spectrum. There is considerable interest in the nature of the emission mechanisms which may be responsible for the observed radiation. The possibility that a single mechanism is responsible for a wide frequency range of the electromagnetic flux suggests that multiple frequency observations of galactic nuclei and quasars can be used to place constraints on models for the source mechanisms involved. In conjunction with observations by the High Energy X-ray Spectrometer on OSO-8, four extragalactic sources have been investigated in this manner: (1) the nucleus of the elliptical galaxy, Centaurus A (NGC 5128); (2) the quasar, 3C273; (3) the nucleus of the Seyfert galaxy, NGC 4151; and (4) the nucleus of the Milky Way galaxy. Concurrent observations have been taken for Cen A at radio and X-ray frequencies, and for NGC 4151 at radio, infrared, optical, and X-ray frequencies. The data from these observations and from other work are used to construct composite spectra (radio to gamma-ray) for the sources. Additionally, a computer program has been developed to obtain source strengths from regions of the sky where more than one source is in the OSO-8. Dissert. Abstr.

N80-26235*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1979 X-RAY OUTBURST OF CEN X-4
L. J. Kaluzienski, S. S. Holt, and J. H. Swank May 1980 25 p refs Submitted for publication
(NASA-TM-80694) Avail: NTIS HC A02/MF A01 CSCL 03B

X-ray observations of the first major outburst (since its initial discovery in 1969) of the 'classical' transient X-ray source Cen X-4 were obtained with the Ariel 5 All-Sky Monitor. The flare light curve exhibits a double-peaked maximum at a level of approximately 4 times the Crab nebula, and its duration and characteristic decay time scale are the shortest yet observed from the class of 'soft' X-ray transients. A total X-ray output of approximately 3 x 10 to the 43rd power ergs, a factor of approximately 20 less than that of the 1969 outburst is estimated. In addition, evidence is found for a regular modulation of the flux during the decline phase at a period of 8.2 plus or minus 0.2 hours. The existing data are consistent with a source model involving episodic mass exchange from a late-type dwarf

onto a neutron star companion in a relatively close binary system. A.R.H.

N80-26236*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EVOLUTION OF SUPERNOVA REMNANTS IN DIFFERENT GALACTIC ENVIRONMENTS, AND ITS EFFECTS ON SUPERNOVA STATISTICS
Minas Kafatos (George Mason Univ.), Sabetino Sofia, Frederick Bruhweiler (Computer Sciences Corp., Silver Spring, Md.), and Theodore R. Gull May 1980 39 p refs
(NASA-TM-80707) Avail: NTIS HC A03/MF A01 CSCL 03B

Examination of the interaction between supernova (SN) ejecta and the various environments in which the explosive event might occur shows that only a small fraction of the many SNs produce observable supernova remnants (SNRs). This fraction, which is found to depend weakly upon the lower mass limit of the SN progenitors, and more strongly on the specfic characteristics of the associated interstellar medium, decreases from approximately 15 percent near the galctic center to 10 percent at Rgal approximately 10 kpc and drops nearly to zero for Rgal > 15 kpc. Generally, whether a SNR is dectectable is determined by the density of the ambient interstellar medium in which it is embeeded. The presence of large, low density cavities arpund stellar associations due to the combined effects of stellar winds and supernova shells strongly suggests that a large portion of the detectable SNRs have runaway stars as their progenitors. These results explain the differences between the substantially larger SN rates in the galaxy derived both from pulsar statistics and from observations of SN events in external galaxies, when compared to the substanially smaller SN rates derived form galactic SNR statistics. A.R.H.

N80-26237# State Univ. of New York at Albany. Space Astronomy Lab.
BACKGROUND SKY BRIGHTNESS MEASUREMENTS FOR APPLICATION TO SPACE SURVEILLANCE SYSTEMS Final Report, 1 Oct. 1977 - 30 Sep. 1979
J. L. Weinberg 14 Feb. 1980 32 p refs
(Contract F49620-78-C-0013; AF Proj. 2311)
(AD-A081881; AFOSR-80-0174TR) Avail: NTIS HC A03/MF A01 CSCL 03/2

Background starlight has been mapped in blue and red wavelengths over the entire sky, using Pioneer 10 observations from beyond the asteroid belt where the zodiacal light is negligible. Zodiacal light has been isolated in observations between 1 and 3 AU to derive heliocentric dependence. The general solution for inversion of the zodiacal light brightness integral has been derived and is used to yield the scattering function of interplanetary dust for each position traversed by the probe moving through the solar system. Properties of the dust are found to change with heliocentric distance. Polarization of zodiacal light was determined at the north celestial, south ecliptic, and north galactic poles. For inner zodiacal light, symmetry plane of interplanetary dust is close to orbital plane of Venus. At 110 degrees from the sun, it is close to orbital plane of Mars. There appears to be more than one symmetary (plane) for the dust; position of maximum dust density relates closely to orbital planes of the planets. Dust rotation/bursting have been studied as possible important mechanism in comets, interplanetary space, reflection nebulae, stellar envelopes, interstellar medium. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see 18 Spacecraft Design Testing, and Performance. For space stations see *15 Launch Vehicles and Space Vehicles.*

N80-26238*# Old Dominion Univ. Research Foundation, Norfolk, Va.
LAMINAR AND TURBULENT FLOW SOLUTIONS WITH RADIATION AND ABLATION INJECTION FOR JOVIAN ENTRY Final Report, period ending 29 Feb. 1980
Ajay Kumar and S. N. Tiwari May 1980 40 p refs
(Grant NsG-1464)
(NASA-CR-163215) Avail: NTIS HC A03/MF A01 CSCL 03B

Laminar and turbulent flow-field solutions with coupled carbon-phenolic mass injection are presented for the forebody of a probe entering a nominal Jupiter atmosphere. Solutions are obtained for a 35-degree hyperboloid and for a 45-degree spherically blunted cone using a time-dependent, finite-difference method. The radiative heating rates for the coupled laminar flow are significantly reduced as compared to the corresponding no-blowing case; however, for the coupled turbulent flow, it is found that the surface radiative heating rates are substantially increased and often exceed the corresponding no-blowing values. Turbulence is found to have no effect on the surface radiative heating rates for the no-blowing solutions. The present results are compared with the other available solutions, and some additional solutions are presented. Author

N80-26239*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMAGES OF MARS: THE VIKING EXTENDED MISSION
Michael H. Carr (Geological Survey) and Nancy Evans 1980 35 p
(NASA-SP-444) Avail: NTIS HC A01; SOD HC $2.25 CSCL 03B

Although the Viking spacecraft were designed to operate for only 90 days, the two landers and one orbiter have been observing seasonal changes in the Martian atmosphere and surface for almost 4 years (2 Martian years). Views of the planet, some taken as recently as late 1979, show volcanoes, lava plains, channels, canyons, plateaus, impact craters, wind erosion, global dust storms, polar caps, clouds, and the surface features of Phobos and Deimos. The latter image is the highest resolution picture ever taken of another object from an orbiter or flying spacecraft. A.R.H.

N80-26240*# Science Applications, Inc., Pasadena, Calif. Planetary Science Inst.
VIKING ORBITER STEREO IMAGING CATALOG Final Report
Karl R. Blasius, Amelia V. Vetrone, and Michael D. Martin (JPL) Washington NASA Jun. 1980 303 p refs
(Contracts NASw-3208; JPL-954149)
(NASA-CR-3277) Avail: NTIS HC A14/MF A01

The extremely long missions of the two Viking Orbiter spacecraft produced a wealth of photos of surface features. Many of which can be used to form stereo images allowing the earth-bound student of Mars to examine the subject in 3-D. This catalog is a technical guide to the use of stereo coverage within the complex Viking imaging data set. Since that data set is still growing (January, 1980, about 3 1/2 years after the mission began), a second edition of this catalog is planned with completion expected about November, 1980. A.R.H.

N80-26241# Tennessee Univ., Knoxville.
DETERMINATION OF PRIMORDIAL AND COSMOGENIC RADIOACTIVITY IN ACHONDRITIC METEORITES BY LOW-LEVEL, GAMMA-RAY SPECTROMETRY Ph.D. Thesis
Richard August Muntean Aug. 1979 140 p refs
(Contract EY-76-C-05-0033)
(DOE/TIC-11096) Avail: NTIS HC A07/MF A01

A high-sensitivity, low-background gamma-ray spectrometer containing two 23 cm by 13 cm thallium-activated, sodium iodide detectors was used to measure long-lived primordial and cosmogenic radioactivity in a suite of achondritic meteorites. Potassium, thorium, uranium, and Al-26 abundances were established for sixteen brecciated eucrites, two unbrecciated eucrites, a nakhlite, a chassignite, and a unique meteorite from Antarctica by nondestructive counting techniques. In several cases, multiple samples of the same meteorite fall were examined. Concentrations ranged from 79.8 ppM to 1150 ppM for potassium, 55.6 ppb to 663 for thorium, 18.1 ppb to 190 ppb for uranium, and 45.0 dpm/kg to 99.0 dpm/kg for Al-26. In addition, a Cs-137 concentration of 264 dpm/kg was observed in the Allan Hills 77005,9 specimen. DOE

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N80-26242*# Illinois Univ., Urbana.
ROCKET OBSERVATIONS OF SOLAR RADIATION DURING THE ECLIPSE OF 26 FEBRUARY 1979
H. M. Bliss and L. G. Smith 1 May 1980 129 p refs
(Grant NGR-14-005-181)
(NASA-CR-163211; UILU-ENG-80-2502; Aeronomy-93) Avail: NTIS HC A07/MF A01 CSCL 03B

Three Nike Tomahawk rockets were launched in Red Lake, Ontario, one previous to, and two during, the total eclipse of the Sun, for the purpose of studying the atmosphere and its interaction with solar radiation. The method and preliminary results of three experiments that were used to measure solar radiation in the X-ray, Lyman-alpha, and visible parts of the spectrum are described. The instrumentation designed for this investigation is discussed as well as post-flight data processing techniques. The retrieved data were processed to some extent to verify that a valid representation of the solar radiation was obtained. The Lyman-alpha experiment yielded very good results, and preliminary data are included. The visible radiation experiment served as support for the other experiments and also functioned well. Due to a high level of energetic particles during the eclipse, the X-ray data were contaminated and are not presented. However, satellite observations indicate no appreciable level of X-rays from the Sun during the time of the eclipse. A.R.H.

N80-26243# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ASPECTS OF SOLAR WIND THEORIES
Rene A. Medrano-B. Dec. 1979 25 p refs Revised
(INPE 1636-RPE/095) Avail: NTIS HC A02/MF A01

A critical review of past and present theories is presented in order to identify the main difficulties that should be surmounted by any modern theoretical model to achieve satisfactory results. It is found that the major difficulties are insufficient knowledge about the damping of the magnetohydrodynamic waves to heat the solar wind protons and about electron heat conduction flux density for the collisionless interplanetary plasma. More experimental information about the boundary conditions of the low corona, which became more important after the coronal holes were identified as probable sources of the solar wind, should be obtained. E.D.K.

N80-26244# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 423, PART 1. PROMPT REPORTS: DATA FOR OCTOBER 1979, SEPTEMBER 1979
Helen E. Coffey Nov. 1979 179 p
(PB80-146160-SGD-423-PT-1; NOAA-79122801) Avail: NTIS HC A09/MF A01 CSCL 03B

This prompt report provides data for October 1979 on: alert periods, daily solar indices, solar flares, solar radio emission, spacecraft observations, solar wind measurements, inferred interplanetary magnetic field polarities, mean solar magnetic field, coronal holes, and Boulder Geomagnetic Substorm Log. It also provides data for September 1979 on: daily solar activity center, sudden ionospheric disturbances, solar x-ray radiation, solar radio emission, cosmic rays, geomagnetic indices and radio propagation indices. GRA

N80-26245# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMER 423, PART 2. COMPREHENSIVE REPORTS. DATA FOR MAY 1979, MARCH 1979 AND MISCELLANEA
Helen E. Coffey Nov. 1979 96 p
(PB80-146178; SGD-423-PT-2; NOAA-79122802) Avail: NTIS HC A05/MF A01 CSCL 03B

This comprehensive report provides data for May 1979 on: solar radio emmission, energetic solar particles and plasma, and solar X-ray radiation. The data for March 1979 consists of: solar flares, synoptic charts, and abbreaviated calendar record. The miscellaneous data includes solar flares spacecraft observations and coronal holes for September 1979, solar radio emission for July and August 1979, cosmic rays for August 1979, regional flare index for February 1979 and stacked magnetograms for selected events in 1978. GRA

N80-26246# National Technical Information Service, Springfield, Va.
SOLAR ECLIPSES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Feb. 1980
Brian Carrigan Mar. 1980 174 p Supersedes NTIS/PS-79/0181; NTIS/PS-78/0241; NTIS/PS-77/0250
(PB80-805732; NTIS/PS-79/0181; NTIS/PS-78/0241; NTIS/PS-77/0250) Avail: NTIS HC $30.00/MF $30.00 CSCL 03B

The bibliography cities observations of solar radiation, solar corona, and effects on the Earth's atmosphere, taken during solar eclipses. Observations of eclipses from 1961 are included. This updated bibliography contains 167 abstracts, 3 of which are new entries to the previous edition. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N80-26247 Yale Univ., New Haven, Conn.
X-RAYS FROM ACTIVE GALACTIC NUCLEI: EMISSION MECHANISMS AND INTERACTION WITH AMBIENT MEDIA Ph.D. Thesis
David Glenn Payne 1979 106 p
Avail: Univ. Microfilms Order No. 8012105

In the context of thermal Comptonization, both steady and time-dependent, the X-ray emission from active galactic nuclei is discussed. Analytic solutions are obtained to the Kompaneets equation for a finite medium. The results are then used to infer various properties of the source. It is argued that, if the X-rays from active galactic nuclei are interpreted as being thermal in origin, the emitting gas must be optically thin to free-free absorption and emission. The enormous X-ray luminosities from active galactic nuclei can then be explained by accretion onto massive black holes through 'non-standard', optically thin (to free-free emission and absorption) accretion disk models. The possibility of there being significant interaction between hard X-rays and ambient media in active galactic nuclei is explored. A model is suggested in which the X-rays produce the broad optical emission lines. For the case of hard X-rays, the ionization and heating is dominated by inelastic Compton scattering, rather than photoionization. Many of the results of the calculations should be applicable to hard X-ray sources in other astronomical contexts. Dissert. Abstr.

N80-26248 Washington Univ., St. Louis, Mo.
ABUNDANCES AND ENERGY SPECTRA OF INDIVIDUAL ELEMENTS IN THE HEAVY COSMIC RAYS Ph.D. Thesis
Jack Tueller 1979 407 p
Avail: Univ. Microfilms Order No. 8013477

Individual element abundances in the charge region equal to or less than Z equal to or less than 30 are derived from two balloon flights of a very large geometry (6.6 sq m ster) electronic detector. The quality of this experiment provided not only single charge resolution over the entire charge range, but also ample statistics to determine relative abundance for each element as a function of energy and atmospheric depth. Absolute energy spectra in the region 0.6 to 1.2 GeV/amu are derived for the reference elements Iron (Z = 26) and Silicon (Z = 14). Some of the unique results of this experiment include: the first measurement of Zinc (Z = 30) which can display a clearly resolved charge peak, a new upper limit on the Cobalt (Z = 27) abundance with significant astrophysical consequences, and an empirically derived correction for atmospheric interactions which significantly reduces the systematic uncertainty in the abundance of secondary elements at the top of the atmosphere. Dissert. Abstr.

N80-26249 Minnesota Univ., Minneapolis.
THE ORIGIN AND RELATIONSHIP OF THE RADIO, INFRARED AND VISUAL RADIATION FROM COMPACT NONTHERMAL SOURCES Ph.D. Thesis
Jeffery John Puschell 1979 269 p
Avail: Univ. Microfilms Order No. 8011872

The results of a study of the flux variability and polarization of compact extragalactic sources are presented. The studied set of 17 objects includes two class 1 Seyfert galaxies (3C 120 and NGC 4151), one class 2 Seyfert (NGC 1068), one broad line radio galaxy (3C 382), two QSOs (III Zw 2 and 3C 273) and 11 BL Lac objects (0109 + 224, AO 0235 + 164, 0300 + 471, Pks 0735 + 178, OI 090.4, OJ 287 Mk 421, 1308 + 326, 1418 + 546, Mk 501 and BL Lac). As BL Lac objects show the most extreme forms of both flux variability and polarization - important characteristics of presumed nonthermal activity - the attention of this dissertation is directed primarily at these sources in the hope they provide the best indications of the intrinsic nature of compact extragalactic nonthermal sources. The spectral-flux distributions of the observed sources are generally flat or peaked in the radio portion of the spectrum with a steep decline into the infrared region. For most of the objects observed, this decline continues into the visual region. But, for some of the sources notably III Zw 2 and 3C 273, the visual spectral-flux distribution cannot be joined smoothly to the infrared, suggesting different physical mechanisms are responsible for the observed emission in each region. Dissert. Abstr.

N80-26250 Minnesota Univ., Minneapolis.
THE ISOTOPIC COMPOSITION OF COSMIC RAYS Ph.D. Thesis
Judith Sharn Young 1979 209 p
Avail: Univ. Microfilms Order No. 8011904

Results from an airborne cosmic ray telescope designed to detect and resolve the isotopes of the heavy cosmic ray nuclei are discussed. Nuclear charge was measured with a double scintillator-Cerenkov array and mass was determined by combining the Cerenkov signal with the residual range measured in a stack of nuclear emulsions. Of the 27,000 nuclei detected, 5,000 nuclei stopped in the nuclear emulsions and are therefore suitable for mass analysis. Mass spectra are presented for the nuclei of Ne, Al, Ca, Sc, Ti, Cr, Mn, Fe, and Ni. The (26) Al/Si abundance ratio places an upper limit of rho approx. <0.4 atoms/cu cm on the density of the interstellar medium in the vicinity of the Sun. An overabundance of (44) Ca was detected, suggesting either large uncertainties in the cross section for production of (44) Ca from iron, or the decay of appreciable amounts of (44) Ti at the source before acceleration. The latter hypothesis suggests that the time delay between nucleosynthesis and acceleration is approx. >100 years. The neutron excess is determined from the iron group isotopes and the astrophysical implications of the results are discussed. Dissert. Abstr.

N80-26251*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IS THE REMNANT OF SN1006 CRAB-LIKE?
R. H. Becker, A. E. Szymkowiak, E. A. Boldt, S. S. Holt, and P. J. Serlemitsos May 1980 14 p refs Submitted for publication
(NASA-TM-80689) Avail: NTIS HC A02/MF A01 CSCL 03B

The solid state spectrometer on the Einstein Observatory and the GSFC cosmic X-ray spectrometer on OSO-8 observed the X-ray spectrum of SN1006. The data can be well-represented by a power-law model with alpha = 1.2, similar to the spectrum of the Crab nebula. This is in contrast to the radio and X-ray maps of SN1006 which show a shell structure more typical of SNR with thermal X-ray emission. The X-ray spectrum is suggestive of nonthermal synchrotron emission, raising the possibility that the remnant of SN1006 contains a source of relativistic electrons. Author

N80-26252*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH RESOLUTION SPECTROSCOPY OF TWO GAMMA-RAY BURSTS IN NOVEMBER 1978
B. J. Teegarden and T. L. Cline Oct. 1979 16 p refs Submitted for publication
(NASA-TM-80575) Avail: NTIS HC A02/MF A01 CSCL 03B

The first results from the ISSEE-3 radiatively colled germanium gammray burst spectrometer are presented. Spectra and time histories from two events on the 1978 November 4 and 1978 November 19 are given. A significant difference in the continuum spectra for the two events was observed. Evidence is presented for two spectral features in the features in the November 19 events, a broad one at approximately 420 key KeV and a narrower one at 740 KeV with a suggestion of an accompanying high energy tail. Author

N80-26253# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MAXIMUM ENTROPY SPECTRAL ANALYSIS OF GEOMAGNETIC DISTURBING INDICES
R. P. Kane Mar. 1980 21 p refs Revised
(INPE-1693-RPE/120-Rev) Avail: NTIS HC A02/MF A01

Burg spectra of geomagnetic disturbance indices Ap, AN, AS, AE, AU, AL, Dst and Cosmic ray neutron intensity at Deep River were obtained for 1965 and 1969 from daily means and for longer periods from monthly means also. A large number of peaks of periodicities from 2 days to several years is obtained, many of which are shown by all the indices and are likely to be genuine. Some of these are harmonics of the 27 days solar rotation period and the 10.2 years sunspot cycle period but may others do not find ready explanation. Results are compared with those of earlier workers who reported fewer peaks. A.R.H.

N80-26254# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NUCLEAR GAMMA RAY LINES FROM SUPERNOVAE
Jeronimo O. D. Jardim Jan. 1980 14 p refs Revised
(INPE-1665-RPE/105) Avail: NTIS HC A02/MF A01

From theoretical observations of the behavior of gamma ray lines fluxes occurring after a supernova explosion, the 1.156 and 0.847 MeV lines are seen to be the most likely to be observed. The 1.156 MeV line was previously observed by other investigators. Observations are reported of the 0.847 MeV line, and 1.332, 1.173 and 0.059 MeV lines using a Ge(Li) telescope aboard a stratospheric balloon which was flown in Brazil in 1977. The observation using a NaI(Tl) detector of a line in the energy interval 1.5 - 1.6 MeV is also reported. It may be due to O18 (p, p prime) O18* reaction. Author

99 GENERAL

N80-26255# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LA RECHERCHE AEROSPATIALE. BIMONTHLY BULLETIN NUMBER 1979-6
1979 92 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 346-409 Original French report available from ONERA, Paris FF 36 Prepared for ESA
(ESA-TT-632; ONERA-NT-1979-6) Avail: NTIS HC A05/MF A01

Topics include: instrumentation for Earth radiation budget measurements, a solar powered air turbine thermal power system, high stability quartz oscillators, plate equilibrium problems, numerical bracketing of the eigen frequencies of complex linear structures, and identification of the elastic characteristics of composite materials. For individual titles, see N80-26256 through N80-26261.

N80-26256# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
BIRAMIS: DIRECT MEASUREMENT OF THE EARTH RADIATION BUDGET BY MEANS OF AN ACCELEROMETER IN SPACE c46
Anne-Marie Mainguy, Alain Bernard, Manola Romero, Jacques Bouttes, and Francois Barlier (CERGA, Grasse, France) *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 1-9 refs Transl. into ENGLISH of La Rech. Aerospatiale,

Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 9 p Presented at the Ann. Congr. of the French Phys. Soc., Toulouse, 25-30 Jun. 1979 Original report in FRENCH previously announced as A79-43634 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

A program for measuring the radiation budget of the Earth using the SUPER CACTUS, an ultrasensitive accelerometer housed in a spherical satellite, was undertaken. The accelerometer measured the resultant of accelerations in the 10 to the minus 9th to minus 10th a range due to radiation pressures from different sources. These were subsequently translated into energy fluxes. Specific results are reported. Author (ESA)

N80-26257# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Turbomachines Div.

AN OPEN CYCLE TURBINE SOLAR THERMAL POWER SYSTEM **c44**

Emile LeGrives *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 11-38 refs Transl. into ENGLISH Of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1979-6, Nov. - Dec. 1979 p 355-373 Original report in FRENCH previously announced as A80-19989 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

Solar electrical power generation using a heated air turbine in conjunction with a tower mounted central receiver and heliostat field was hybrid fossil fuel fired so as to avoid thermal storage problems. Using a regenerative gas turbine open cycle, no cooling system was required. It is shown that with a solar receiver concept allowing a fast thermal response to transient radiation situations, a turbine inlet temperature of 1100 to 1150 K can be reached with an overall efficiency (power available on turbine shaft/power radiated into receiver) of 25 percent, with a 2000 Sun concentration ratio. Solar receiver, turbocompressor and regenerator sizes are given for a thermal power input of 1 MW into the receiver. Author (ESA)

N80-26258# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

RESEARCH OF AN OPTIMAL CONFIGURATION FOR HIGH STABILITY QUARTZ OSCILLATORS ON BOARD AIRCRAFT AND MISSILES **c33**

Jacques Beaussier *In its* La Rech. Aerospatiale, Bimonthly Bull. no. 1979-6 (ESA-TT-632) 1979 p 39-53 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1979-6, Nov. - Dec. 1979 p 375-386 Original report in FRENCH previously announced as A80-19990 Sponsored in part by DRET (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

The optimal configuration of compact and easily startable quartz oscillators of stability close to that of atomic clocks for use in the time frequency systems of aircraft and missiles is summarized. The stability requirements of a time frequency standard are discussed and the operating parameters of quartz oscillators and atomic clocks are compared. The configurations of oscillators developed are then described, taking into consideration problems encountered with the resonator and the electronic circuits associated with it and the specifications, operation, design, and significance of the dual thermostats within the oscillators. The four 5 MHz and two 100 MHz oscillators realized are described, and results of test of test of long, medium and short term frequency stability in nonperturbed environments and of acceleration and temperature sensitivity in simulated aircraft and missile environments are reported. It is found that the 5 MHz oscillators exhibit greater stability while the 100 MHz oscillators are smaller, and quartz oscillator stabilities surpassing those of rubidium standards are reported. Author (ESA)

N80-26259# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

VARIATIONAL FORMULATION OF THE PLATE EQUILIBRIUM PROBLEM. APPLICATION TO ISOPARAMETRIC FINITE ELEMENTS OF PLATES, PART 1 **c39**

Daniel Osmont and Raoul Girard *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 55-67 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 387-394 Original report in FRENCH previously announced as A80-19991 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

The problem of plate equilibrium is discussed in terms of a stress tensor and displacement space for a plate discretizable by isoparametric finite elements. The stress tensor is derived from the three dimensional equilibrium equations assuming the linearly of parallel stresses in the midplane of the plate, and the form of the Reissner functional is obtained for the stress tensor and for stress displacement pairs. A mixed variational formulation and displacement variational formulations to which finite elements with linear interpolation within the thickness of the plate can be applied are then defined for the problem of plate equilibrium. Author (ESA)

N80-26260# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

NUMERICAL BRACKETING OF THE EIGENVALUES OF COMPLEX LINEAR STRUCTURES **c64**

Philippe Gibert *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 69-78 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 395-400 Original report in FRENCH previously announced as A80-19992 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

Consideration is given to the numerical bracketing of the eigenvalues of a symmetrical operator associated with elliptical partial differential equations for the case of a complex linear structure. A method for solving a supplemental static problem by means of a mixed variational formulation is presented. It is shown that the method allows an explicit boundary for the eigenvalue error to be obtained, as well as an approximate constraint which would verify the equilibrium equations better than that obtained by a standard finite element method. The application of the method to a one dimensional problem is illustrated, and it is noted that it can also be reduced to the level of a finite element solutions. Author (ESA)

N80-26261# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

IDENTIFICATION OF THE ELASTIC CHARACTERISTICS OF COMPOSITE MATERIALS BY MEANS OF VIBRATION TESTS AND A MODEL OF DISCRETE CONSERVATIVE CALCULATION **c24**

Daniel Engrand and Daniel Louis *In its* La Rech. Aerospatiale, Bimonthly Bull. No. 1979-6 (ESA-TT-632) 1979 p 79-90 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1979-6, Nov. - Dec. 1979 p 401-409 Original report in FRENCH previously announced as A80-19993 (For primary document see N80-26255 16-99)
Avail: NTIS HC A05/MF A01

A method for determining the elastic properties necessary to define a truly representative calculation model of a composite structure is proposed. The method consists of defining, in terms of stiffness, the difference between a preliminary computation and experimentally determined eigenmodes, and then iteratively minimizing this difference in elasticity coefficients by adjusting the calculation model. Applications of the proposed method to three orthotropic cylindrical shells are presented which demonstrate its rapid convergence. Author (ESA)

N80-26262# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

AGARD HIGHLIGHTS

Mar. 1980 65 p refs
(AD-A082960: AGARD-Highlights-80/1) Avail: NTIS HC A04/MF A01 CSCL 05/1

Contents: The Role of Italy in Space Cooperation; Philosophy of Aeronautical Development Programmes for Italian Defence Modernization; Spacelab - a Reality of Today Projected into the Future; Summary of 1980 Meeting Themes. GRA

N80-26263# Office of Naval Research, London (England).

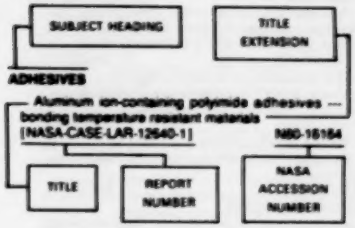
EUROPEAN SCIENTIFIC NOTES, VOLUME 34, NO. 1

Willard D. Bascom and Robert E. Machol 31 Jan. 1980 55 p refs
(AD-A081929; ESN-34-1) Avail: NTIS HC A04/MF A01 CSCL 05/2

This is a monthly publication presenting brief articles concerning recent developments in European Scientific Research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by calling attention to current developments and to institutions and individuals engaged in these scientific efforts. The articles are written primarily by members of the staff of ONRL and occasionally articles are prepared by, or in cooperation with, a member of the scientific staff of the United States Air Force's European Office of Aerospace Research and Development and the United States Army Research and Standardization Group. Articles are also contributed by visiting Stateside scientists.GRA

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

ABRASION RESISTANCE
Applications of sprayed coatings N80-25507
ABRASIVES
Fly ash erosion in gas turbine materials N80-25859
ABSORPTION
Solarization of heliostat glasses
[SAND-79-8754] N80-25858
ABSORPTION SPECTRA
Electrothermal atomization in atomic absorption spectrometry: Fundamental causes of interference effects and a study of an exploding thin film atomizer N80-25385
Resonance Raman spectroscopy of adsorbed species at solid-gas interfaces N80-25386
Stark effect spectrophone for continuous absorption spectra monitoring
[NASA-CASE-NPO-15102-1] N80-25538
ABSORPTION SPECTROSCOPY
Measurement and correlation of molecular metal pollutants in the air to existing weather conditions. Development of carbon atomizers for atomic absorption with high sensitivity and metal speciation capability N80-25913
ABUNDANCE
Abundances and energy spectra of individual elements in the heavy cosmic rays N80-26248
ACCELEROMETERS
Data generator for a satellite-borne three-axis accelerometer
[AD-A082627] N80-25638
BIRAMIS: Direct measurement of the Earth radiation budget by means of an accelerometer in space N80-26256
ACCIDENT INVESTIGATION
Equations for determining aircraft motions for accident data
[NASA-TM-79809] N80-25306
ACCIDENT PREVENTION
Funding for highway safety research, development, and demonstration in the National Highway Traffic Safety Administration
[PB80-137672] N80-26200
ACHONDRITES
Determination of primordial and cosmogenic radioactivity in achondritic meteorites by low-level, gamma-ray spectrometry
[DOE/TIC-11096] N80-26241
ACID BASE EQUILIBRIUM
The relationship of exercise performance to variations in blood acid-base status induced by changes in the inspired oxygen fraction N80-26030
ACOUSTIC EXCITATION
Notes on various noise sources N80-25486
ACOUSTIC MEASUREMENTS
Classification of operating conditions of turbomachines from solid borne sound N80-25282
Measured and predicted impingement noise for a model-scale under the wing external blown flap configuration with a QCSEE type nozzle
[NASA-TM-81494] N80-26115
ACOUSTICAL HOLOGRAPHY
Digital wavefront reconstruction for acoustical applications N80-26112
ACOUSTICS
A theoretical and experimental investigation of the effects of the interaction between an acoustic field and cylindrical structure on sound transmission loss N80-26114
ACOUSTO-OPTICS
Line spread instrumentation for propagation measurements N80-25592
ACTIVITY CYCLES (BIOLOGY)
Innate and genetic nature of circadian rhythms
[DOE/TIC-11132] N80-26038
ADAPTIVE CONTROL
Design of microcomputer adaptive controllers N80-26081
ADAPTIVE FILTERS
Digital signal processing with an adaptive delay element N80-25537
ADHESION
Plasma aided techniques N80-25501
ADHESIVES
Bulk polymerization and stability of anaerobic adhesives
[MLM-2647] N80-25450
AERIAL PHOTOGRAPHY
On optical imaging through aircraft turbulent boundary layers
[AMP-334] N80-25596
Advanced image compression study
[AD-A082014] N80-25637
U.S. geological survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft, Sequoia, Kings, Canyon National Park, California. Project no. 8: Conservation of natural areas and of the genetic material they contain
[PB80-147291] N80-25775
The combination of aerial and terrestrial photogrammetry in structural monitoring N80-25963
AERIAL RECONNAISSANCE
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
Applications of remote sensing to emergency management
[AD-A082243] N80-25765
AERODYNAMIC CHARACTERISTICS
Aircraft wake vortices. Citations from the NTIS data base
[PB80-805866] N80-25303
AERODYNAMIC CONFIGURATIONS
Exploratory studies of the cruise performance of upper surface blown configurations. Experimental program: Test facilities, model design instrumentation, and lowspeed, high-lift tests
[NASA-CR-3192] N80-25297
High bypass turbofan component development. Phase 2: Detailed design
[AD-A082753] N80-25341
Measured and predicted impingement noise for a model-scale under the wing external blown flap configuration with a QCSEE type nozzle
[NASA-TM-81494] N80-26115
AERODYNAMIC DRAG
Drag measurements of conical afterbodies at subsonic and transonic speeds
[DFVLR-FB-79-27] N80-25302
The influence of ballistic damage on the aeroelastic characteristics of lifting surfaces — fighter aircraft
[AD-A082536] N80-25322
Data generator for a satellite-borne three-axis accelerometer
[AD-A082627] N80-25638
AERODYNAMIC FORCES
High-speed T-38A landing gear extension loads
[NASA-TM-58226] N80-25319
Measurement of external forces and torques on a large pointing system N80-25610
Validity of small scale tests for turret/fairing loads and cavity effects N80-25611
Aero-optics overview — laser applications N80-25612
AERODYNAMIC HEATING
Computer program documentation modified version of the JA70 aerodynamic heating computer program H800 (MINIVER with a DISSPLA plot package
[NASA-CR-160685] N80-26064
AERODYNAMIC INTERFERENCE
Aerodynamic interference between two Darrieus wind turbines
[SAND-79-1984C] N80-25897
AERODYNAMIC NOISE
La Recherche Aerospatiale, Bimonthly Bulletin no. 1979-5
[ESA-TT-613] N80-25485
Notes on various noise sources N80-25486
AERODYNAMIC STALLING
Unsteady pressure measurements at stall and buffeting
[DFVLR-MITT-79-09] N80-25300
AERODYNAMICS
Aeronautical engineering: A continuing bibliography, supplement 122
[NASA-SP-7037(122)] N80-25274
Viscous thin airfoil theory
[NASA-CR-163069] N80-25299
Proceedings of the Aero-Optics Symposium on Electromagnetic Wave Propagation from Aircraft
[NASA-CP-2121] N80-25588
Overview of 6- X 6-foot wind tunnel aero-optics tests — transonic wind tunnel tests N80-25590
Summary of all cycle II.5 shear and boundary layer measurements, aerodynamics N80-25604
Flow visualization techniques in the Airborne Laser Laboratory program N80-25608
Reduction of unsteady wind torques on an open port airborne optical turret N80-25609

Vortex model of the Darrieus turbine: An analytical and experimental study
[SAND-79-7058] N80-25887

AEROELASTICITY

The influence of ballistic damage on the aeroelastic characteristics of lifting surfaces — fighter aircraft
[AD-A082536] N80-25322

Experimental determination of unsteady blade element aerodynamics in cascades. Volume 1: Torsion mode cascade
[NASA-CR-159831] N80-25335

Transonic small perturbation equation applied to the solution of two-dimensional unsteady flows
N80-25489

AERONAUTICAL ENGINEERING

Aeronautical engineering: A continuing bibliography, supplement 122
[NASA-SP-7037(122)] N80-25274

AEROSOLS

Pollutant measurements in plumes from power plants and cities - St. Louis area, July 1976. A project MISTT (midwest sulfur transformation and transport) report
[PB80-139058] N80-25935

Proceedings of the Atmospheric Tracers and Tracer Application Workshop
[LA-8144-C] N80-25980

AEROSPACE ENGINEERING

Magnetic refrigeration for space applications: Report on a design study
[LA-8134] N80-25492

AGARD highlights
[AD-A082980] N80-26262

AEROSPACE MEDICINE

Aerospace medicine and biology. A continuing bibliography, supplement 207
[NASA-SP-7011(207)] N80-26032

AEROTHERMODYNAMICS

Unsteady aerothermodynamics modeling
N80-25489

AFTERBODIES

Drag measurements of conical afterbodies at subsonic and transonic speeds
[DFVLR-FB-79-27] N80-25302

AGGLOMERATION

SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids
[NASA-CR-161473] N80-25354

AGREEMENTS

Agreement governing the activities of states on the Moon and other celestial bodies, parts 1 and 2
[GPO-59-896] N80-26199

AGRICULTURE

Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737

Wind energy applications in agriculture: Executive summary
[DOE/SEA-1109-20401-79/2] N80-25807

Environmental development plan: Solar agricultural and industrial process heat
[DOE/EDP-0033] N80-25862

Biosources digest, a journal on biomass utilization, volume 1, no. 1
[PB80-140973] N80-25908

Biosources digest: A journal on biomass utilization, volume 1, no. 4
[PB80-140981] N80-25909

AIR CONDITIONING

Multi-use geothermal energy system with augmentation for enhanced utilization. A non-electric application of geothermal energy in Susanville, California
[SAN-1740-2] N80-25868

AIR CONDITIONING EQUIPMENT

Comparative performance of two types of evacuated tubular solar collectors in a residential heating and cooling system
[COO-2577-19] N80-25864

Site and building energy conservation study: Survey of building 251, diagnostic chemistry
[UCRL-15190] N80-25880

AIR DROP OPERATIONS

Parachutes and decelerators, volume 2. Citations from the NTIS data base
[PB80-806946] N80-25305

AIR LAND INTERACTIONS

Examination of the empirical flux-profile models in the atmospheric surface boundary layer
[INPE-1747-RPE/140] N80-25971

On the momentum transport by the stationary waves forced by the topography
[INPE-1720-RPE/125] N80-25990

AIR POLLUTION

Pollutant emissions from flat-flame burners at high pressures
[NASA-TP-1673] N80-25392

Diesel exhaust emissions. Citations from the American Petroleum Institute data base
[PB80-805419] N80-25879

Measurement and correlation of molecular metal pollutants in the air to existing weather conditions. Development of carbon atomizers for atomic absorption with high sensitivity and metal speciation capability N80-25913

Meteorological effects on air pollution in Sao Paulo
[INPE-1669-RPE/107] N80-25914

National Emissions Data System (NEDS), fuel use report
[PB80-148905] N80-25919

Probability modeling and estimation for hourly variation of air pollution concentrations. Study on statistics and environmental factors in health (SIMS)
[DOE/EY-22874/66] N80-25924

A study of emissions from passenger cars in six cities, volume A
[PB80-149800] N80-25930

An empirical relationship between mesoscale carbon monoxide concentrations and vehicular emission rates
[PB80-136308] N80-25932

Assessment of vertical distributions of photochemical pollutants and meteorological variables in the vicinity of urban areas
[PB80-139918] N80-25933

Pollutant measurements in plumes from power plants and cities - St. Louis area, July 1976. A project MISTT (midwest sulfur transformation and transport) report
[PB80-139058] N80-25935

Methods for analyzing inorganic compounds in particles emitted from stationary sources
[PB80-141781] N80-25936

Modeling of buoyant plume dispersion in complex terrain
[PB80-145337] N80-25938

Mechanisms of photochemical reactions in urban air
[PB80-132364] N80-25939

Flue gas desulfurization by the modified citrate process: Report of investigations
[PB80-134836] N80-25940

Transfer standards for the calibration of ambient air monitoring analyzers for ozone: Technical assistance document
[PB80-146871] N80-25941

Biogenic hydrocarbon contribution to the ambient air of selected areas - Tulsa; Great Smokey Mountains; Rio Blanco County, Colorado
[PB80-139066] N80-25945

Solid sorbent for collecting atmospheric sulfur dioxide
[PB80-131949] N80-25948

The use of pH and chloride electrodes for the automatic control of flue gas desulfurization systems
[PB80-136464] N80-25947

Guidance for lowest achievable emission rates from 18 major stationary sources of particulate, nitrogen oxides, sulfur dioxide, or volatile organic compounds
[PB80-140262] N80-25948

Performance measures and standards for air quality simulation models
[PB80-152836] N80-25950

Compliance status of major air pollution facilities
[PB80-154560] N80-25952

Measurement of perchloroethylene in ambient air
[PB80-144678] N80-25953

Test methods to determine the mercury emissions from sludge incineration plants
[PB80-144611] N80-25954

Cross-country urban and rural measurements of NOx and SO2
[PB80-137227] N80-25955

AIR QUALITY

Air quality data for metals, 1976, from the National Air Surveillance Networks
[PB80-147432] N80-25951

Synoptic meteorology and air quality patterns in the St. Louis RAPS program
[PB80-148299] N80-26012

AIR SAMPLING

Evaluation of stationary source particulate measurement methods. Volume 4: Basic oxygen furnaces
[PB80-141833] N80-25937

Solid sorbent for collecting atmospheric sulfur dioxide
[PB80-131949] N80-25948

AIR TRAFFIC

Handbook of airline statistics: Supplement
[PB80-136407] N80-25309

AIR TRANSPORTATION

Handbook of airline statistics: Supplement
[PB80-136407] N80-25309

Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-136472] N80-26217

Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-136480] N80-26218

AIR WATER INTERACTIONS

Hydrological and ecological models of shallow lakes and reservoirs
[IIASA-CP-78-14] N80-25720

AIRBORNE EQUIPMENT

Minimum performance standards: Airborne Omega receiving equipment
[RTCA/DO-164A] N80-25310

Environmental conditions and test procedures for airborne equipment
[RTCA-309-79/SC135-41] N80-25329

Comparison of onboard aircraft Nicad battery chargers
[AD-A082515] N80-25540

Inviscid Flow Field Effects: Experimental results — optical distortions over airborne laser turrets
N80-25599

Overview of recent aero-optics flight tests
N80-25601

Optical measurements of degradation in aircraft boundary layers N80-25603

Summary of aerodynamic vibration effects on ALL turret N80-25607

Flow visualization techniques in the Airborne Laser Laboratory program N80-25608

Reduction of unsteady wind torques on an open port airborne optical turret N80-25609

Measurement of external forces and torques on a large pointing system N80-25610

Aero-optics overview — laser applications
N80-25612

AIRBORNE/SPACEBORNE COMPUTERS

Relations for a flight performance computer
N80-25281

An Automatic Fault Indentification System (AFIS) on board N80-25289

AIRCRAFT

Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763

AIRCRAFT ACCIDENTS

Equations for determining aircraft motions for accident data
[NASA-TM-79809] N80-25306

Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307

Aircraft survival design guide. Volume 5: Aircraft postcrash survival
[AD-A082513] N80-25308

AIRCRAFT COMMUNICATION

Audio systems characteristics and minimum performance standards. Aircraft microphones (except carbon), aircraft headsets and speakers and aircraft audio selector panels and amplifiers
[RTCA-305-79/SC132-54-REV-2] N80-25514

AIRCRAFT COMPARTMENTS

USAF bioenvironmental noise data handbook. Volume 144: F-106A in-flight crew noise
[AD-A081846] N80-25916

USAF bioenvironmental noise data handbook. Volume 145: F-106B in-flight crew noise
[AD-A081847] N80-25917

USAF bioenvironmental noise data handbook. Volume 146: F-16B in-flight crew noise
[AD-A081848] N80-25918

AIRCRAFT CONFIGURATIONS
Transonic flow field analysis for wing-fuselage configurations
[NASA-CR-3243] N80-25295
AIRCRAFT CONSTRUCTION MATERIALS
Evaluation of existing flammability test methods by comparison of the flammability characteristics of interior materials
[AD-A083137] N80-25393
AIRCRAFT CONTROL
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163206] N80-25344
AIRCRAFT DESIGN
Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307
Aircraft survival design guide. Volume 5: Aircraft postcrash survival
[AD-A082513] N80-25308
AIRCRAFT ENGINES
Engine component improvement: Performance improvement, JT9D-7 3.8 AR fan
[NASA-CR-159806] N80-25332
Cold-air investigation of a 4 1/2 stage turbine with stage-loading factor of 4.66 and high specific work output. 2: Stage group performance
[NASA-TP-1686] N80-25336
Performance deterioration based on in-service engine data: JT9D jet engine diagnostics program
[NASA-CR-159525] N80-25340
Technical evaluation report on the 54th(A) Propulsion and Energetics Panel Meeting on Advanced Control Systems for Aircraft Powerplants
[AGARD-AR-152] N80-25347
Determination of the effects of ambient conditions on CFM56 aircraft engine emissions
[PB80-136597] N80-25844
AIRCRAFT EQUIPMENT
Evaluation of nondestructive inspection methods for aircraft tires
[AD-A082523] N80-25681
Texas HIPLEX, 1979: Field operations summary
[PB80-134471] N80-26010
AIRCRAFT INSTRUMENTS
Aircraft integrated data systems — conference proceedings, Friedrichshafen, West Germany, 26-27 Sep. 1978
[DFVLR-MITT-79-03] N80-25275
Navaids calibration evaluation with a computer-controlled avionics-data acquisition system N80-25287
Research of an optimal configuration for high stability quartz oscillators on board aircraft and missiles N80-26258
AIRCRAFT MAINTENANCE
The SYDAS flight data processing system N80-25285
The use of AIDS data at KLM N80-25286
AIRCRAFT MODELS
Theoretical study of nonadiabatic boundary-layer stabilization times in a cryogenic wind tunnel for typical stainless steel wing and fuselage models
[NASA-TM-80212] N80-25614
AIRCRAFT PERFORMANCE
Aircraft dynamic response to damaged runways
[AGARD-R-685] N80-25325
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327
Parameters affecting aircraft performance on runways in bad condition N80-25328
AIRCRAFT PRODUCTION
Cost estimating relationships for airframes in the development and production phases
[NASA-TM-80229] N80-26198
AIRCRAFT RELIABILITY
Investigations on local fault detection at turbojet engines N80-25278
The Engine Usage Monitoring System (EUMS): An heuristic approach to cost effective flight data monitoring and analysis N80-25280
Classification of operating conditions of turbomachines from solid borne sound N80-25282
Reduction of measured data and a method of early detection of sensor breakdown N80-25283
Description of the British Civil Aviation airworthiness data recording program N80-25284
The SYDAS flight data processing system N80-25285
The use of AIDS data at KLM N80-25286
AIRCRAFT SAFETY
Aircraft wake vortices. Citations from the NTIS data base
[PB80-805866] N80-25303
Visual problems and night landing guidance of the CH-47 (Chinook) helicopter
[ARL/SYS-TM-50] N80-25312
AIRCRAFT STRUCTURES
Unsteady pressure measurements at stall and buffeting
[DFVLR-MITT-79-09] N80-25300
A study of the reinforcement required for cutouts in aircraft semi-monocoque structure N80-25317
Flight service evaluation of an advanced composite empennage component on commercial transport aircraft
[NASA-CR-159286] N80-25320
Applications of sprayed coatings N80-25507
Optical phase distortion due to compressible flow over laser turrets N80-25598
Optimized laser turrets for minimum phase distortion N80-25600
Summary of aerodynamic vibration effects on ALL turret N80-25607
Reduction of unsteady wind torques on an open port airborne optical turret N80-25609
Validity of small scale tests for turret/fairing loads and cavity effects N80-25611
AIRCRAFT WAKES
Aircraft wake vortices. Citations from the NTIS data base
[PB80-805866] N80-25303
AIRFOILS
Diffusion bonded boron/aluminum spar-shell fan blade
[NASA-CR-159571] N80-25382
Overlay coatings for gas turbine airfoils N80-25506
AIRFRAMES
Thermal-structural design study of an airframe-integrated Scramjet
[NASA-CR-159039] N80-25334
Cost estimating relationships for airframes in the development and production phases
[NASA-TM-80229] N80-26198
AIRPLANE PRODUCTION COSTS
Cost estimating relationships for airframes in the development and production phases
[NASA-TM-80229] N80-26198
AIRPORTS
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915
ALABAMA
Solar energy system performance evaluation: Seasonal report for IBM system 1A, Huntsville, Alabama
[NASA-CR-161464] N80-25790
ALASKA
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
ALBEDO
New goals for snow monitoring by satellite N80-25745
The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25761
ALGAE
Biological and synthetic systems for production of hydrogen from water — using hydrogenase with algae, chloroplasts, or synthetic catalysts
[PB80-146269] N80-25480
ALGOL
LANAC: A high level language for data acquisition and process control by minicomputers
[INPE-1721-RPE/126] N80-26063
ALGORITHMS
Microprocessor self-diagnosis N80-26042
A microprogrammable digital signal processor: Conception, design, application N80-26043
Adaptive MSE estimation algorithms N80-26047
The complexity of parallel algorithms N80-26048
Performance comparisons of several adaptive least mean square algorithms N80-26051
Research on parallel estimators
[CERT-1/7125-DERA] N80-26052
Algorithms for sample classification and image feature selection — remote sensing of Earth resources
[INPE-1718-RPE/124] N80-26059
The structure of parallel algorithms
[AD-A081967] N80-26069
Algorithm to integrate systems of nonlinear ordinary differential equations, with application to the advanced Fiper code
[GA-A-15143] N80-26096
ALKALINE BATTERIES
Pulse charging of lead-acid traction cells
[NASA-TM-81513] N80-25780
ALKANES
Various techniques for evaluating cardiodynamic function using chronically instrumented canine models
[AD-A071264] N80-26035
ALLOCATIONS
Funding for highway safety research, development, and demonstration in the National Highway Traffic Safety Administration
[PB80-137672] N80-26250
ALLOYS
Alloy development for irradiation performance in fusion reactors
[COO-6098] N80-25428
Laser surface alloying N80-25804
ALPINE METEOROLOGY
Topoclimatological and snowhydrological survey of Switzerland
[EB0-10164] N80-25739
ALPS MOUNTAINS (EUROPE)
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755
ALTIMETERS
Arc program documentation
[NASA-CR-156867] N80-26054
ALUMINUM ALLOYS
SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids
[NASA-CR-161473] N80-25354
Diffusion bonded boron/aluminum spar-shell fan blade
[NASA-CR-159571] N80-25382
Investigation of the mechanical and corrosion properties of MA-87 aluminum powder alloy
[AD-A082457] N80-25418
Electrochemical properties of certain new ternary and quaternary alloys based on aluminum
[UCRL-TRANS-11535] N80-25431
ALUMINUM COATINGS
Corrosion protection by electro-deposited aluminum N80-25505
AMBIENT TEMPERATURE
Determination of the effects of ambient conditions on CFM56 aircraft engine emissions
[PB80-136597] N80-25844
AMORPHOUS MATERIALS
Amorphous silicon solar cells by hydrogen implantation
[SAN-3042-1] N80-25842
Amorphous thin films for solar cell application
[DOE/ET-23040/1] N80-25882
ANALOG CIRCUITS
Pattern classification using charge transfer devices
[NASA-CR-163237] N80-25760
ANALOG TO DIGITAL CONVERTERS
Digital sound: An investigation of delta-modulation/pulse-code-modulation -digital conversion
[BBC-RD-1980/3] N80-25518
ANALOGS
High frequency analog LSI development
[AD-A082664] N80-25543
ANALYSIS (MATHEMATICS)
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
[AD-A082494] N80-25313
ANELASTICITY
Anelastic studies of interstitially trapped hydrogen in niobium
[DOE/ER-01198/1299] N80-25427
Inelastic transient stress analysis for thermal and mechanical loading N80-25699

ANGLE OF ATTACK
Sensor for measuring instantaneous angle of attack of helicopter blades
[NASA-CR-3297] N80-25330
ANISOTROPY
The concept of effective stress applied to elasticity and to viscoplasticity in the presence of anisotropic damage
[RAE-LIB-TRANS-2039] N80-25806
ANNIHILATION REACTIONS
Charmed meson production and decay properties at the psi(3770)
[SLAC-219] N80-26127
Synchrotron cooling and annihilation of an E(+)-E(-) plasma: The radiation mechanism for the March 5, 1979 transient
[NASA-TM-80674] N80-26229
ANNUAL VARIATIONS
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10163] N80-25738
Estimating long-term statistics for annual precipitation for six regions of the United States from tree-ring data
[UCRL-15162] N80-26005
Mariners weather log, volume 23, no. 6
[PB80-145113] N80-26011
ANNULAR FLOW
Long tube heat exchanger: The facility and some preliminary tests on the down center/up annular flow configuration
[SAND-78-0823] N80-25623
ANTARCTIC REGIONS
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
ANTENNA DESIGN
Communication satellite technology: State of the art and development opportunities
[NASA-CR-159877] N80-25358
ANTENNA RADIATION PATTERNS
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 2: Appendices
[AD-A081133] N80-25315
Shuttle Ku-band and S-band communications implementation study
[NASA-CR-160662] N80-25522
Wideband adaptive antenna nulling using tapped delay lines
[AD-A082854] N80-25527
An alternate algorithm for correction of the scanning multichannel microwave radiometer polarization radiances using Nimbus-7 observed data
[NASA-TM-80672] N80-25762
ANTHROPOMETRY
Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307
ANTIMISSILE DEFENSE
A simple graphical model for analyzing radar homing interceptor engagements
[AD-A082480] N80-25528
APPROACH AND LANDING TESTS (STS)
Orbiter/shuttle carrier aircraft separation: Wind tunnel, simulator, and flight test overview and results
[NASA-TM-58223] N80-25372
APPROACH CONTROL
Head-up transition behavior of pilots during simulated low-visibility approaches
[NASA-TP-1618] N80-26039
APPROACH INDICATORS
Flight evaluation of a radar cursor technique
[AD-A083027] N80-25519
APPROXIMATION
Suboptimal approximations for control in optimal dynamic programs — trajectory optimization for Earth-Mars or orbit transfer problems
[INPE-1676-TDL/019] N80-26086
Some convexity properties of Euler's gamma function
[MC-ZW-105/78] N80-26099
ARC SPRAYING
Materials Coating Techniques
[AGARD-LS-106] N80-25499
ARCHITECTURE (COMPUTERS)
The structure of parallel algorithms
[AD-A081967] N80-26069
ARCTIC OCEAN
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
Phytoplankton primary production below Arctic Ocean pack ice: An ecosystems analysis N80-26028
ARGON PLASMA
Experimental investigation of gas flow dynamics of an inductively coupled argon plasma N80-26146
ARIZONA
Geologic application of thermal-inertia mapping from satellite — Powder River Basin, Wyoming and Cabeza Prieta Arizona
[E80-10151] N80-25733
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
Geophysical and hydrologic prediction of fissuring and land subsidence, south-central Arizona
[PB80-151434] N80-25777
Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161450] N80-25787
AROMATIC COMPOUNDS
Chemical ionization mass spectrometry of nitroaromatic vapors
[AD-A081228] N80-25386
ARTIFICIAL INTELLIGENCE
Using representative knowledge to guide decision making in automatic diagnostic systems
[INPE-1686-RPE/117-REV] N80-26033
ARTIFICIAL SATELLITES
Cost-effectiveness measures of replenishment strategies for systems of orbital spacecraft
[AD-A081859] N80-25356
ASHES
Fly ash erosion in gas turbine materials N80-25659
ASSEMBLER ROUTINES
LANAC: A high level language for data acquisition and process control by minicomputers
[INPE-1721-RPE/126] N80-26063
ASSOCIATIVE PROCESSING (COMPUTERS)
Applications of a reconfigurable array of flexible processors in intelligence information retrieval
[AD-A082324] N80-26195
ASTRONOMICAL SPECTROSCOPY
An analysis of the atmosphere of the RV Tauri star AC Herculis N80-26226
ATLANTIC OCEAN
GEOS-3 radar altimeter study for the South Atlantic Bight
[NASA-TM-73296] N80-26023
ATMOSPHERIC ATTENUATION
Rain rate range profiling from a spaceborne radar
[NASA-TM-80656] N80-25989
ATMOSPHERIC BOUNDARY LAYER
Examination of the empirical flux-profile models in the atmospheric surface boundary layer
[INPE-1747-RPE/140] N80-25971
ATMOSPHERIC CHEMISTRY
Mechanisms of photochemical reactions in urban air
[PB80-132384] N80-25939
Proceedings of the Atmospheric Tracers and Tracer Application Workshop
[LA-8144-C] N80-25980
ATMOSPHERIC CIRCULATION
Synoptic meteorology and air quality patterns in the St. Louis RAPS program
[PB80-148299] N80-26012
Isentropic trajectories for derivation of objectively analyzed meteorological parameters
[PB80-143118] N80-26018
The climatic impact of sea surface temperature anomalies on zonally symmetric and asymmetric flows: A quasi-geostrophic modeling approach N80-26022
ATMOSPHERIC COMPOSITION
Proceedings of the workshop on Stratospheric and Mesospheric Impacts of Satellite Power Systems (SPS)
[CONF-7809197] N80-25363
Review of Spectroscopic Data for Measurements of Stratospheric Species
[NASA-CP-2136] N80-26125
ATMOSPHERIC DIFFUSION
Proceedings of the Atmospheric Tracers and Tracer Application Workshop
[LA-8144-C] N80-25980
ATMOSPHERIC EFFECTS
Effects of construction and operation of a satellite power system upon the magnetosphere — injection of orbit transfer vehicle exhaust
[ATR-80(7824)-1] N80-25365
Summary of aerodynamic vibration effects on ALL turret N80-25607
ATMOSPHERIC ENTRY
Laminar and turbulent flow solutions with radiation and ablation injection for Jovian entry — radiative heating rates for the Galileo probe
[NASA-CR-163215] N80-26238
ATMOSPHERIC MODELS
Probability modeling and estimation for hourly variation of air pollution concentrations. Study on statistics and environmental factors in health (SIMS)
[DOE/EY-22874/86] N80-25924
An energy-balance climate model with separate land and oceanic effects N80-25962
Examination of the empirical flux-profile models in the atmospheric surface boundary layer
[INPE-1747-RPE/140] N80-25971
Vortex generation in a nested grid numerical thunderstorm model N80-25986
A model for modification of the cloud-topped marine boundary layer during cold air outbreak N80-25988
Numerical weather prediction and its outlook in Brazil
[INPE-1670-RPE/108] N80-25996
A hydrometeorological model for medium sized hydrographic basins
[INPE-1729-TDL/025] N80-25997
Models of atmospheric water vapor budget for the Texas HIPLEX area
[PB80-147986] N80-26013
ATMOSPHERIC MOISTURE
Models of atmospheric water vapor budget for the Texas HIPLEX area
[PB80-147986] N80-26013
ATMOSPHERIC PRESSURE
Synoptic meteorology and air quality patterns in the St. Louis RAPS program
[PB80-148299] N80-26012
ATMOSPHERIC SCATTERING
The effect of atmospheric particulate matter on the propagation of a laser beam
[AD-A083039] N80-25648
ATMOSPHERIC TEMPERATURE
Some observed and theoretical aspects of the sudden stratospheric heating in the Northern and Southern Hemispheres
[INPE-1671-TDL/016] N80-25976
ATMOSPHERIC TURBULENCE
Airborne measurement of atmospheric turbulence N80-25606
ATOMIC COLLISIONS
Important atomic collision processes in the heavy ion inertial fusion program
[SAN-0115-137-1] N80-26129
ATOMIC STRUCTURE
Relation between the electronic structure and the shock sensitivity of nitrated secondary explosives. 3: Influence of the crystal environment
[UCRL-TRANS-11510] N80-25458
Electronic structure, bonding and chemisorption in metallic hydrides
[LA-UR-80-458] N80-26184
ATOMIZERS
Electrothermal atomization in atomic absorption spectrometry: Fundamental causes of interference effects and a study of an exploding thin film atomizer N80-25385

Measurement and correlation of molecular metal pollutants in the air to existing weather conditions. Development of carbon atomizers for atomic absorption with high sensitivity and metal speciation capability N80-25913

ATOMS

Oscillator strengths for highly ionized atomic systems
[COO-4264-13] N80-26130

ATS 6

ATS-6 measurements during AVEFRIA
[AD-A082192] N80-25525

AUSTENITIC STAINLESS STEELS

Solidification behavior of austenitic stainless steel filler metals
[ORNL/TM-7116] N80-25424

AUTOMATA THEORY

Semiautomated calibration: A case study
[SAND-79-2004C] N80-25643

Using representative knowledge to guide decision making in automatic diagnostic systems
[INPE-1686-RPE/117-REV] N80-26033

AUTOMATIC CONTROL

The use of pH and chloride electrodes for the automatic control of flue gas desulfurization systems
[PB80-138464] N80-25847

AUTOMATIC FLIGHT CONTROL

Flight-deck automation: Promises and problems
[NASA-TM-81206] N80-25040

AUTOMATIC PILOTS

MCC level C formulation requirements. Entry guidance and entry autopilot, optional TAEM targeting
[NASA-TM-81072] N80-25369

AUTOMATIC TEST EQUIPMENT

Software quality assurance: One of the software acquisition engineering guidebook series
[AD-A082425] N80-26070

AUTOMOBILE ENGINES

Directions in automotive engine research and development
[CONF-800212-2] N80-25671

Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies
[NASA-CR-163228] N80-26204

Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings
[NASA-CR-163229] N80-26205

Near-term hybrid vehicle program, phase 1
[NASA-CR-163230] N80-26206

Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report
[NASA-CR-163231] N80-26207

Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package
[NASA-CR-163232] N80-26208

Energy-storage systems for automobile propulsion, 1979 study. Volume 3: Battery/flywheel electric vehicles using advanced batteries
[UCRL-52841-VOL-3] N80-26213

AUTOMOBILE FUELS

Directions in automotive engine research and development
[CONF-800212-2] N80-25671

AUTOMOBILES

Liquid hydrogen-fueled vehicle project
[LA-UR-79-2683] N80-25467

Continuously variable transmissions: Theory and practice
[UCRL-15037] N80-25668

A study of emissions from passenger cars in six cities, volume A
[PB80-149800] N80-25830

A study of emissions from passenger cars in six cities, volume B
[PB80-149816] N80-25831

An empirical relationship between mesoscale carbon monoxide concentrations and vehicular emission rates
[PB80-138308] N80-25932

Near hybrid passenger vehicle development program, phase 1. Appendices A and B. Mission analysis and performance specification studies report, volume 1
[NASA-CR-163330] N80-26201

Near hybrid passenger vehicle development program, phase 1. Appendices C and D, Volume 2
[NASA-CR-163331] N80-26202

Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210

AXIAL COMPRESSION LOADS

Buckling of sandwich panels subjected to axial compression, shear forces and lateral pressures. Part 2: Analysis
[SAAB-TN-AE-72-BT-2] N80-25695

Incremental stress-strain law for graphite under multiaxial loadings
[GA-A-15573] N80-25704

B

B STARS

Atmospheres for hot, high-gravity, pure helium stars N80-26224

Calculations of NLTE carbon 2-4 spectra in line-blanketed model atmospheres of early-type stars N80-26225

BACKGROUND NOISE

Colored measurement noise digital prefiltering by averaging
[DFVLR-MITT-79-08] N80-25316

BACKGROUND RADIATION

Background sky brightness measurements for application to space surveillance systems — zodiacal light and interplanetary dust
[AD-A081881] N80-26237

BALLISTIC MISSILES

SIXDOF: A computer program for trajectory simulation of ballistic flight vehicles
[SAND-79-8260] N80-26077

BALLISTIC TRAJECTORIES

SIXDOF: A computer program for trajectory simulation of ballistic flight vehicles
[SAND-79-8260] N80-26077

BALLOON FLIGHT

Proceedings of the Atmospheric Tracers and Tracer Application Workshop
[LA-8144-C] N80-25980

BAROCLINIC WAVES

Baroclinic wave vacillations N80-25980

BARRIER LAYERS

Fabrication and diagnostics of oxide tunneling barriers in niobium based superconductive tunnel junctions N80-26176

BASIC (PROGRAMMING LANGUAGE)

The RSZ BASIC programming language manual
[NASA-TM-80690] N80-26053

BATTERY CHARGERS

Comparison of onboard aircraft Nicad battery chargers
[AD-A082515] N80-25540

Pulse charging of lead-acid traction cells
[NASA-TM-81513] N80-25780

BAYES THEOREM

Bayesian reliability theory for repairable equipment
[AD-A083009] N80-25684

A comparison of smooth empirical Bayes estimators N80-26102

BEACHES

Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735

BEAUFORT SEA (NORTH AMERICA)

Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25783

Phytoplankton primary production below Arctic Ocean pack ice: An ecosystems analysis N80-26028

BEDS (GEOLOGY)

Drilling horizontal holes in coal bed from the surface with water jets
[SAND-80-0057C] N80-25766

BEDS (PROCESS ENGINEERING)

Synthane pilot plant, South Park Township, Pennsylvania
[COO-0003-41-T1] N80-25455

Optimization studies of various coal-conversions systems: Coal dissolution phenomena
[FE-2274-7] N80-25461

EDS coal liquefaction process development, phase 4. EDS commercial plant study design update, offsite design basis: Illinois coal market flexibility sensitivity case
[FE-2993-37] N80-25475

BEHAVIOR

Chances of detecting and differentiating central system effects of drugs in animal experiments with special consideration of behavioural pharmacological methods
[RAE-LIB-TRANS-2034] N80-26029

BENDING

Study of the effects of bending and microbending on glass fibers
[AD-A081239] N80-25702

Study of dynamic effects on glass fibers
[AD-A081238] N80-25703

BIBLIOGRAPHIES

Aeronautical engineering: A continuing bibliography, supplement 122
[NASA-SP-7037(122)] N80-25274

Aircraft wake vortices. Citations from the NTIS data base
[PB80-805886] N80-25303

Aircraft sonic boom: Effects on buildings. Citations from the NTIS data base
[PB80-806334] N80-25304

Parachutes and decelerators, volume 2. Citations from the NTIS data base
[PB80-806946] N80-25305

Gas and steam turbines, general: Corrosion and erosion, Volume 2. Citations from the NTIS data base
[PB80-806664] N80-25342

Gas and steam turbines, general: Corrosion and erosion. Citations from the engineering index data base
[PB80-806672] N80-25343

Space Colonies. Citations from the International Aerospace Abstracts data base
[NASA-CR-163204] N80-25353

Tungsten and tungsten alloy powder metallurgy. Citations from the NTIS data base
[PB80-806011] N80-25434

Tungsten and tungsten alloy powder metallurgy. Citations from the Engineering Index data base
[PB80-806029] N80-25435

Superalloys, Volume 2. Citations from the NTIS data base
[PB80-805831] N80-25436

superalloys, volume 3. Citations from the Engineering Index data base
[PB80-805849] N80-25437

Superalloys, volume 4. Citations from the Engineering Index data base
[PB80-805856] N80-25438

Hydrogen embrittlement of metals. Citations from the American Petroleum Institute data base
[PB80-805963] N80-25439

Hydrogen embrittlement of metals, volume 2. Citations from the NTIS data base
[PB80-805948] N80-25440

Hydrogen embrittlement of metals, volume 3. Citations from the Engineering Index data base
[PB80-805955] N80-25441

Corrosion of stainless steel, volume 2. Citations from the NTIS data base
[PB80-805906] N80-25442

Reinforced plastics: Fiberglass reinforcement, volume 2. Citations from the NTIS data base — with polymer matrices
[PB80-804743] N80-25451

Reinforced plastics: Boron, carbon, and other reinforcing materials, volume 3. Citations from the NTIS data base — polymer matrices
[PB80-804750] N80-25452

Synthetic fuels: Methane, volume 1. Citations from the Engineering Index data base
[PB80-805245] N80-25478

Synthetic fuels: Methane, volume 2. Citations from the Engineering Index data base
[PB80-805252] N80-25479

Metrication in the United States. Citations from the NTIS data base
[PB80-806938] N80-25497

Satellite television. Citations from the NTIS data base
[PB80-806318] N80-25531

Satellite television transmission. Citations from the Engineering Index data base
[PB80-806318] N80-25532
Electron beam semiconductor devices. Citations from the NTIS data base
[PB80-805997] N80-25585
Electron beam semiconductor devices. Citations from the Engineering Index data base
[PB80-806003] N80-25586
Schottky Barrier devices. Citations from the NTIS data base
[PB80-804778] N80-25557
Schottky barrier devices, volume 4. Citations from the Engineering Index data base
[PB80-804784] N80-25558
Schottky barrier devices, volume 5. Citations from the Engineering Index data base
[PB80-804792] N80-25559
Switching circuits, volume 2. Citations from the NTIS data base
[PB80-805880] N80-25580
Switching circuits. Citations from the Engineering Index data base
[PB80-805898] N80-25581
Hybrid microelectronic circuits, volume 2. Citations from the NTIS data base
[PB80-805822] N80-25562
Hybrid microelectronic circuits, volume 3. Citations from the Engineering Index data base
[PB80-805830] N80-25563
Transistor amplifiers, volume 2. Citations from the NTIS data base
[PB80-806037] N80-25566
Fluid control devices, volume 2. Citations from the NTIS data base
[PB80-805290] N80-25632
Fluid control devices. Citations from the Engineering Index data base
[PB80-805278] N80-25633
Electron beam welding, volume 2. Citations from the NTIS data base
[PB80-805871] N80-25674
Electron beam welding, volume 2. Citations from the Engineering Index data base
[PB80-805889] N80-25675
Diesel exhaust emissions, volume 2. Citations from the NTIS data base
[PB80-805385] N80-25676
Diesel exhaust emission control for motor vehicles, volume 1. Citations from the Engineering Index data base
[PB80-805393] N80-25677
Diesel exhaust emission control for motor vehicles, volume 2. Citations from the Engineering Index data base
[PB80-805401] N80-25678
Diesel exhaust emissions. Citations from the American Petroleum Institute data base
[PB80-805419] N80-25679
Gas bearings. Citations from the Engineering Index data base
[PB80-802507] N80-25680
Fatigue testing machines. Citations from the International Aerospace Abstracts data base
[NASA-CR-162943] N80-25719
Remote sensing applied to petroleum and mineral exploration. Citations from the International Aerospace Abstracts data base
[NASA-CR-163311] N80-25770
Instrumentation and data processing used in Earth Resources Technology Satellites (ERTS), volume 2. Citations from the NTIS data base
[PB80-805740] N80-25771
Research to identify components of energy-related wastes: A state-of-the-art report — environment effects, bibliographies
[PB80-137961] N80-25943
Hurricanes forecasting, modification, and research. Citations from the NTIS data base
[PB80-804255] N80-26020
Aerospace medicine and biology. A continuing bibliography, supplement 207
[NASA-SP-7011(207)] N80-26032
Time series forecasting and prediction. Citations from the NTIS data base
[PB80-804396] N80-26107
Gallium arsenide epitaxial growth, volume 2. Citations from the NTIS data base
[PB80-805963] N80-26189
Gallium arsenide epitaxial growth, volume 3. Citations from the Engineering Index data base
[PB80-805591] N80-26190
Relativity theory. Citations from the NTIS data base
[PB80-805542] N80-26192
Technical publications of the NASA-Wallops Flight Center, 1973 - 1979
[NASA-TM-73285] N80-26193
Solar eclipses. Citations from the NTIS data base
[PB80-805732] N80-26246
BINARY CODES
Comparison between results of the HELIOS and MIRVAL computer codes applied to central receiver solar-energy collection
[SAND-79-8286] N80-26075
BINARY STARS
Periodic mass transfer in the X-ray binary system Her X-1/HZ Her N80-26227
The 1979 X-ray outburst of Cen X-4
[NASA-TM-80694] N80-26235
BIOACOUSTICS
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915
USAF bioenvironmental noise data handbook. Volume 144: F-106A in-flight crew noise
[AD-A081846] N80-25916
USAF bioenvironmental noise data handbook. Volume 145: F-106B in-flight crew noise
[AD-A081847] N80-25917
USAF bioenvironmental noise data handbook. Volume 148: F-16B in-flight crew noise
[AD-A081848] N80-25918
BIODYNAMICS
Measurement of the mechanical impedance of human soft tissue in vivo N80-26031
BIOINSTRUMENTATION
Development of an automated stress/duress detection system, phase 1 and phase 2
[SAND-79-7036] N80-26036
BIOLOGICAL EFFECTS
Aerospace medicine and biology. A continuing bibliography, supplement 207
[NASA-SP-7011(207)] N80-26032
BIOMASS
Environmental control technology for biomass flash pyrolysis
[CONF-800129-2] N80-25477
Simulation model of an oligotrophic lake — Lake Onega N80-25728
BIOMASS ENERGY PRODUCTION
Liquid fuels production from biomass, no. 7
[COO-4388-7] N80-25462
Thermochemical conversion of biomass: An overview of R and D activities sponsored by the biomass energy systems branch of DOE
[PNL-SA-8296] N80-25485
Conversion of biomass materials into gaseous products. Operation of the PDU
[SAN-1241-3] N80-25486
Potential applications of biomass technology at National Technology Laboratories and Mississippi Army Ammunition Plant
[AD-A082756] N80-25797
Problems and opportunities for solar energy in biomass, pyrolysis, and gasification
[SERI/TP-332-495] N80-25810
Biosources digest, a journal on biomass utilization, volume 1, no. 1
[PB80-140873] N80-25908
Biosources digest: A journal on biomass utilization, volume 1, no. 4
[PB80-140881] N80-25909
BIOMETRICS
Measurement of the mechanical impedance of human soft tissue in vivo N80-26031
Development of an automated stress/duress detection system, phase 1 and phase 2
[SAND-79-7036] N80-26036
BIOSPHERE
U.S. geological survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft, Sequoia, Kings, Canyon National Park, California. Project no. 8: Conservation of natural areas and of the genetic material they contain
[PB80-147291] N80-25775
User's manual for biosphere and dose simulation program (BIODOSE)
[UCRL-15188] N80-26037
BIRD-AIRCRAFT COLLISIONS
High bypass turbofan component development. Phase 1: Fan detail design
[AD-A082821] N80-25336
BIREFRINGENCE
High repetition rate electro-optic Q-switching of Nd(3+):YAG lasers showing strong optical birefringence
[IPF-79-6] N80-25686
BIT SYNCHRONIZATION
Critique of the Hughes Aircraft shuttle Ku band leading edge bit synchronizer
[NASA-CR-160661] N80-25521
BLADE TIPS
Study of blade aspect ratio on a compressor front stage
[NASA-CR-159556] N80-25333
BLUNT BODIES
Stability of the laminar boundary layer on a blunted plate in supersonic flow N80-25292
BODY-WING CONFIGURATIONS
Transonic flow field analysis for wing-fuselage configurations
[NASA-CR-3243] N80-25295
BOILERS
Design of a system using CPC collectors to collect solar energy and to produce industrial process steam
[ANL-79-102] N80-25814
BOILING
Boiling heat transfer and critical heat flux in helical coils N80-25576
BOLTZMANN TRANSPORT EQUATION
Steady state Boltzmann equation solution by numerical relaxation
[DOE/ET-15422/T3] N80-26095
BORON REINFORCED MATERIALS
Diffusion bonded boron/aluminum spar-shell fan blade
[NASA-CR-159571] N80-25382
Reinforced plastics: Boron, carbon, and other reinforcing materials, volume 3. Citations from the NTIS data base — polymer matrices
[PB80-804750] N80-25452
BOUNDARY LAYER CONTROL
Static and transient performance of YF-102 engine with up to 14 percent core airbleed for the quiet short-haul research aircraft
[NASA-TP-1602] N80-25339
BOUNDARY LAYER FLOW
Stability of the laminar boundary layer on a blunted plate in supersonic flow N80-25292
Overview of 6- X 6-foot wind tunnel aero-optics tests — transonic wind tunnel tests N80-25590
Pressure and temperature fields associated with aero-optics tests — transonic wind tunnel tests N80-25591
Unsteady density and velocity measurements in the 6 foot x 6 foot wind tunnel N80-25594
The plasma boundary layer and magnetopause layer of the Earth's magnetosphere N80-25959
BOUNDARY LAYER STABILITY
Stability of the laminar boundary layer on a blunted plate in supersonic flow N80-25292
Theoretical study of nonadiabatic boundary-layer stabilization times in a cryogenic wind tunnel for typical stainless steel wing and fuselage models
[NASA-TM-80212] N80-25614
BOUNDARY LAYER TRANSITION
Correlation of nosetip boundary-layer transition data measured in ballistics-range experiments
[SAND-79-0649C] N80-25628
BOUNDARY LAYERS
Summary of all cycle II.5 shear and boundary layer measurements, aerodynamics N80-25604
A regional surface wind model for mountainous coastal areas
[PB80-146152] N80-26014
BOUNDARY VALUE PROBLEMS
Numerical solution of the incompressible Navier-Stokes equations about a three-dimensional body using boundary-fitted coordinates N80-25577
Finite element analysis of problems with infinitely distant boundaries
[PB80-149230] N80-26100
BRAKES (FOR ARRESTING MOTION)
Parachutes and decelerators, volume 2. Citations from the NTIS data base
[PB80-806946] N80-25305

BRAYTON CYCLE
Compact closed cycle Brayton system feasibility study, volume 1 — marine propulsion
[AD-A081379] N80-25686
BRAZIL
Meteorological effects on air pollution in Sao Paulo
[INPE-1669-RPE/107] N80-25914
BRIGHTNESS
Geometry of Orbiting Earth Satellites (GOES)
[AD-A082381] N80-25362
Effect of nonlinear refraction on beam brightness in laser fusion applications
[LA-UR-80-417] N80-25655
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758
BRIGHTNESS TEMPERATURE
Brightness temperature measurements for high-energy jet propagation
[UCRL-83609] N80-25819
BROADCASTING
NBS time and frequency dissemination services
[PB80-147747] N80-25494
BROWNIAN MOVEMENTS
Feasibility studies for light scattering experiments to determine the velocity relaxation of small particles in a fluid
[NASA-CR-163214] N80-25586
BUCKLING
Buckling of sandwich panels subjected to axial compression, shear forces and lateral pressures. Part 2: Analysis
[SAAB-TN-AE-72-BT-2] N80-25695
BUFFETING
Unsteady pressure measurements at stall and buffeting
[DFVLR-MITT-79-09] N80-25300
BUILDINGS
Analysis of tentative seismic design provisions for buildings
[PB80-129182] N80-25496
Performance evaluation of a selected three-ton air-to-air heat pump in the heating mode
[ORNL/CON-34] N80-25630
Theoretical and physical approach to light gage steel shear diaphragms N80-25691
Solar energy system performance evaluation. Albuquerque Western no. 1, Albuquerque, New Mexico
[SOLAR/1011-79/14] N80-25816
Evaluation of residential building energy performance standards
[LBL-9816] N80-25849
Site and building energy-conservation study: Survey of building 251, diagnostic chemistry
[UCRL-15190] N80-25880
Proposed energy performance standards for new buildings: Standard building operating conditions
[DOE/CS-0118] N80-25901
Proposed energy-performance standards for new buildings: Passive and active solar-heating analysis
[DOE/CS-0117] N80-25902
BURNERS
Pollutant emissions from flat-flame burners at high pressures
[NASA-TP-1673] N80-25392
BURSTS
The Goddard program of gamma ray transient astronomy
[NASA-TM-80675] N80-26230
The 1979 X-ray outburst of Cen X-4
[NASA-TM-80694] N80-26235
High resolution spectroscopy of two gamma-ray bursts in November 1978
[NASA-TM-80575] N80-26252

C

C-135 AIRCRAFT
Cycle II.5 aircraft aero-optical turbulent boundary-layer/shear-layer measurements N80-25605
CADMIUM
The impurity resistivity of In doped CdS
[INPE-1685-RPE/116-REV] N80-25391
CALCIUM CARBONATES
The role of iron and calcium in the cycling of phosphates in shallow lakes N80-25722
CALCULATORS
Some queuing network models of computer systems
[NASA-CR-160893] N80-26062
CALIBRATING
F-104 low-gravity calibration tests for materials processing in space precursory experiments
[NASA-TM-78278] N80-25355
Semiautomated calibration: A case study
[SAND-79-2004C] N80-25643
CALIFORNIA
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta
[E80-10152] N80-25734
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10163] N80-25736
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753
Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758
U.S. geological survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft, Sequoia, Kings, Canyon National Park, California. Project no. 9: Conservation of natural areas and of the genetic material they contain
[PB80-147291] N80-25775
Multi-use geothermal energy system with augmentation for enhanced utilization. A non-electric application of geothermal energy in Susanville, California
[SAN-1740-2] N80-25868
CAMS
The dynamic analysis of high-speed flexible cam mechanisms N80-25658
CANADA
HCMM: Soil moisture experiment — South Alberta, Canada
[E80-10166] N80-25741
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
CAPACITORS
Comparison of flying compacitor bridge circuits and inductor-convertor bridge circuits for the transfer of energy between superconducting coils
[CONF-791075-4] N80-25546
CAPE KENNEDY LAUNCH COMPLEX
Vector wind profile gust model
[NASA-CR-161474] N80-25992
Vector wind profile gust model
[NASA-CR-161475] N80-25993
A diffusion climatology for Cape Canaveral, Florida
[NASA-TM-58224] N80-25994
CAPSULES
Collapse of experimental capsules under external pressure
[PNL-3165] N80-25705
CARBIDES
Wear resistant coatings made by chemical vapour deposition N80-25508
CARBON
Reinforced plastics: Boron, carbon, and other reinforcing materials, volume 3. Citations from the NTIS data base — polymer matrices
[PB80-804780] N80-25462
Solar collector studies for solar heating and cooling applications
[ALO-5355-T1] N80-25850
Calculations of NLTE carbon 2-4 spectra in line-blanketed model atmospheres of early-type stars N80-26225
CARBON DIOXIDE
Displacement of oil by carbon dioxide
[DOE/MC-03260/4] N80-25768
CARBON DIOXIDE LASERS
Short-pulse CO2-laser damage studies of NaCl and KCl windows
[LA-UR-80-108] N80-25649
CARBON MONOXIDE
An empirical relationship between mesoscale carbon monoxide concentrations and vehicular emission rates
[PB80-138308] N80-25832
CARBONATES
High-temperature fuel cell research and development
[SAN-1485-T1] N80-25846
Fuel cell research on second-generation molten-carbonate systems
[SAN-11276-1] N80-25847
High temperature fuel cell research and development
[SAN-1485-2] N80-25848
CARDIOVASCULAR SYSTEM
Various techniques for evaluating cardiodynamic function using chronically instrumented canine models
[AD-A071264] N80-26035
CARGO
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-126472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-126480] N80-26218
CASCADE FLOW
Experimental determination of unsteady blade element aerodynamics in cascades. Volume 1: Torsion mode cascade
[NASA-CR-159831] N80-25335
CASCADE WIND TUNNELS
Experimental investigation of the particle-number concentration in the wind tunnel for use of the laser anemometry
[DFVLR-FB-79-28] N80-25352
CAST ALLOYS
Section size effects on toughness of various cast steels N80-25410
CATALOGS (PUBLICATIONS)
Viking orbiter stereo imaging catalog
[NASA-CR-3277] N80-26240
CATALYSTS
Developmental research program for clean industrial and transportation fuels from coal: Milestone report on comparison of catalysts, March 1979
[FE-2514-M4] N80-25471
Oxygen reduction on a graphite paste and a catalyst loaded graphite paste electrode
[IS-T-886] N80-25898
Chemisorption and reactivity studies of small molecules on rhodium surfaces
[LBL-9471] N80-26186
CATALYTIC ACTIVITY
Catalytic hydrogenation of coal-derived liquids
[FE-2034-17] N80-25398
Catalytic conversion of methanol to low molecular weight hydrocarbons
[COO-4717-T1] N80-25470
CATHODES
Evaluation of air cathodes for potential use in development of aluminum-air cells
[UCID-18561] N80-25893
A disc LaB6 cathode for plasma production in magnetic field
[IPPJ-448] N80-26155

CAVITATION FLOW
Finite element simulation of simple three-dimensional fully cavitating flows
[AD-A082823] N80-25616
Plastic creep flow effects in the diffusive cavitation of grain boundaries
[COO-3084-74] N80-25711

CAVITIES
Elastic-wave radiation from spherical sources — Seismic radiation source
[UCRL-52867] N80-25529

CENTRAL NERVOUS SYSTEM
Chances of detecting and differentiating central system effects of drugs in animal experiments with special consideration of behavioural pharmacological methods
[RAE-LIB-TRANS-2034] N80-26029

CENTRAL PROCESSING UNITS
An application of software design and documentation language — Galileo spacecraft command and data subsystem
[NASA-CR-160258] N80-26057

CERAMIC COATINGS
Techniques of chemical vapor deposition N80-25502

CERAMICS
Advances in materials science
[UCRL-50058-79-3] N80-25376
Microstructures of structural ceramics N80-25445
Failure analysis of ceramic-to-metal seals
[BDX-613-2414] N80-25449
Development of nondestructive evaluation techniques for high-temperature ceramic heat exchange components
[ANL/MSD/FE-80-1] N80-25685
High-temperature fuel cell research and development
[SAN-1485-T1] N80-25846
High temperature fuel cell research and development
[SAN-1485-2] N80-25848

CH-47 HELICOPTER
Visual problems and night landing guidance of the CH-47 (Chinook) helicopter
[ARL/SYS-TM-50] N80-25312

CHANNEL CAPACITY
VHF air-ground communication technology and spectrum utilization
[RTCA/DO-169] N80-25510

CHANNEL FLOW
Convective heat transfer in MHD channels and its influence on channel performance
[CONF-800104-5] N80-26186

CHARACTER RECOGNITION
Development of Logoscan 2
[AD-A081821] N80-26067

CHARGE EXCHANGE
Charge exchange measurements of ion behavior in the ISX Tokamak N80-26149

CHARGE TRANSFER DEVICES
Pattern classification using charge transfer devices
[NASA-CR-163237] N80-25760

CHEBYSHEV APPROXIMATION
Inequalities for joint distribution of quadratic forms
[AD-A083033] N80-26090

CHEMICAL EQUILIBRIUM
Modified NASA-Lewis chemical equilibrium code for MHD applications
[NASA-TM-80903] N80-26162

CHEMICAL PROPERTIES
Electrochemical properties of certain new ternary and quaternary alloys based on aluminum
[UCRL-TRANS-11535] N80-25431

CHEMICAL REACTIONS
A study of reactions in a time-of-flight mass spectrometer N80-25367
Thermal conductivity measurements and molecular association in ethanol vapor
[CONF-791134-8] N80-25403
Thermal fatigue and oxidation data of oxide dispersion-strengthened alloys
[NASA-CR-159842] N80-25415
Critical studies of the rapid pyrolysis and hydropyrolysis of coal
[FE-MIT-2295T28-9] N80-25459
Consequences of the mass spectrometric and infrared analysis of oils and asphaltenes for the chemistry of coal liquefaction. Characterization of coal-derived liquids and other fossil fuel related materials employing mass spectrometry
[FE-2537-10] N80-25460
Optimization studies of various coal-conversions systems: Coal dissolution phenomena
[FE-2274-7] N80-25461
Statistical treatment of heterogeneous chemical reaction in shock-initiated explosives
[UCID-16548] N80-25489
Catalytic conversion of methanol to low molecular weight hydrocarbons
[COO-4717-T1] N80-25470
Techniques of chemical vapor deposition N80-25502
Simulation of chemical reaction in a turbulent flow
[ISM-253] N80-25820
Chemisorption and reactivity studies of small molecules on rhodium surfaces
[LBL-9471] N80-26186

CHEMISORPTION
Electronic structure, bonding and chemisorption in metallic hydrides
[LA-UR-80-458] N80-26184
Chemisorption and reactivity studies of small molecules on rhodium surfaces
[LBL-9471] N80-26186

CHESAPEAKE BAY (US)
Physical alterations of coastal shorelines: An analysis of Chesapeake Bay shore zone development and regulation
[PB80-140875] N80-25956

CHLOROETHYLENE
Measurement of perchloroethylene in ambient air
[PB80-144679] N80-25953

CHLOROPHYLLS
Use of chlorophyll/Secchi Disk relationships — for predicting changes in water transparency due to varying plankton concentrations N80-25732
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta
[E80-10152] N80-25734

CHLOROPLASTS
Biological and synthetic systems for production of hydrogen from water — using hydrogenase with algae, chloroplasts, or synthetic catalysts
[PB80-146289] N80-25480

CHROMIUM
Development of materials for a luminescent solar collector
[COO-4806-1] N80-25812

CHROMIUM ALLOYS
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[FE-3050-T2] N80-25421

CHROMIUM STEELS
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[RR-79-9D9-HYTEM-R3] N80-25419

CIRCADIAN RHYTHMS
Innate and genetic nature of circadian rhythms
[DOE/TIC-11132] N80-26038

CIRCUIT BOARDS
Improving delamination resistance of multilayer printed wiring boards
[BDX-613-2413] N80-25548
Pattern classification using charge transfer devices
[NASA-CR-163237] N80-25760

CIRCUIT DIAGRAMS
Semiconductor measurement technology: Accurate linewidth measurements on integrated-circuit photomasks
[PB80-148216] N80-25564

CIRCUIT RELIABILITY
High reliability, low cost integrated circuits, phase 2 development report
[AD-A081666] N80-25539

CIRCUITS
Power take-off analysis for diagonally connected MHD channels
[CONF-800104-6] N80-26167

CIRCULAR TUBES
Windtunnel tests of a tubular supersonic inlet for projectiles
[DFVLR-FB-79-26] N80-25367

CITIES
Assessment of methods for control of fugitive emissions from paved roads
[PB80-139330] N80-25495
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
Assessment of vertical distributions of photochemical pollutants and meteorological variables in the vicinity of urban areas
[PB80-139918] N80-25933
Mechanisms of photochemical reactions in urban air
[PB80-132284] N80-25939

CITRATES
Flue gas desulfurization by the modified citrate process: Report of investigations
[PB80-134836] N80-25940

CLADDING
Computer control for a cladding thickness tester
[DP-1537] N80-25845
Explosively joining dissimilar metal tubes
[AD-A082068] N80-25663

CLASSIFICATIONS
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment
[E80-10160] N80-25736
Pattern classification using charge transfer devices
[NASA-CR-163237] N80-25760
Algorithms for sample classification and image feature selection — remote sensing of Earth resources
[INPE-1718-RPE/124] N80-26069

CLEAN FUELS
Catalytic hydrogenation of coal-derived liquids
[FE-2034-17] N80-25366
Feasibility study of using a coal/water oil emulsion as a clean liquid fuel
[FE-2437-T1-ADD] N80-25463
Developmental research program for clean industrial and transportation fuels from coal: Milestone report on comparison of catalysts, March 1979
[FE-2514-M4] N80-25471

CLEANING
Cleaning agents and techniques for concentrating solar collectors
[SAND-80-7005C] N80-25860

CLIMATE
An energy-balance climate model with separate land and oceanic effects N80-25962
Climate program plan, volume 1 — effects of energy technologies on climate and environment
[DOE/EV-0062/1] N80-26003
The climatic impact of sea surface temperature anomalies on zonally symmetric and asymmetric flows: A quasi-geostrophic modeling approach N80-26022

CLIMATOLOGY
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Evaluation of the typical meteorological years for solar heating and cooling system studies
[SERI/TR-8150-1] N80-26001
Transport and diffusion climatology of the US Atlantic and Gulf coasts
[BNL-26991] N80-26002
Texas HIPLEX interim progress report — high plains cooperative program for weather modification
[PB80-133101] N80-26009
Satellite cloud climatological results, 1978: Comparison to 1976-77
[PB80-148117] N80-26019
Hurricanes forecasting, modification, and research. Citations from the NTIS data base
[PB80-804255] N80-26020

CLINICAL MEDICINE
Using representative knowledge to guide decision making in automatic diagnostic systems
[INPE-1686-RPE/117-REV] N80-26033

CLOSED CYCLES
Compact closed cycle Brayton system feasibility study, volume 1 — marine propulsion
[AD-A081379] N80-25666

CLOUD COVER
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
HCMM: Soil moisture experiment — South Alberta, Canada
[E80-10166] N80-25741
New goals for snow monitoring by satellite N80-25745
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Deershak, Libby and Hungry Horse River Basins N80-25750
The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25781
Statistical analysis of multivariate atmospheric variables — cloud cover
[NASA-CR-161472] N80-25991
Satellite cloud climatological results, 1978: Comparison to 1976-77
[PB80-148117] N80-26019

CLOUD PHOTOGRAPHY
Introduction to interpreting satellite imagery
[INPE-1681-RPE/113] N80-25999

CLOUD PHYSICS
The Precipitation Enhancement Project (PEP) — a report on the training workshop on weather modification for meteorologists held in Villadolid, Spain, March 1979
[DFVLR-MITT-79-12] N80-26006
Case studies of convective storms. Case study 4: First echoe case, 27 July 1976
[PB80-143233] N80-26007
Texas HIPLEX interim progress report — high plains cooperative program for weather modification
[PB80-133101] N80-26009
Texas HIPLEX, 1979: Field operations summary
[PB80-134471] N80-26010
Liquid water measurements in high elevation continental cumuli
[PB80-143828] N80-26017

CLOUD SEEDING
Texas HIPLEX, 1979: Field operations summary
[PB80-134471] N80-26010

CLOUDS (METEOROLOGY)
A model for modification of the cloud-topped marine boundary layer during cold air outbreak N80-25988
Introduction to interpreting satellite imagery
[INPE-1681-RPE/113] N80-25999
Environmental satellite imagery
[PB80-153356] N80-26015

CLUMPS
Hybrid clustering N80-26105

CMOS
Performance of digital integrated circuit technologies at very high temperature
[SAND-79-2092C] N80-25550

COAL
Critical studies of the rapid pyrolysis and hydropyrolysis of coal
[FE-MIT-2295T26-9] N80-25459
Preparation of a coal conversion systems technical data book
[FE-2286-44] N80-25472
Evaluation of physical/chemical coal cleaning and flue gas desulfurization
[PB80-147622] N80-25481
Economic baselines for current underground coal mining technology
[NASA-CR-163259] N80-25764
Drilling horizontal holes in coal bed from the surface with water jets
[SAND-80-0057C] N80-25766
Remote electromagnetic sensing of underground coal burns
[FE-2414-8] N80-25767

COAL GASIFICATION
Synthane pilot plant, South Park Township, Pennsylvania
[COO-0003-41-T1] N80-25455
Evaluation of the Texaco synthesis gas generation process for the production of hydrogen from SRC-2 residue
[ORNL/SUB-7240/6] N80-25464
Test and evaluate the TRI-GAS low Btu coal gasification process
[FE-2798-74] N80-25476

COAL LIQUEFACTION
Catalytic hydrogenation of coal-derived liquids
[FE-2034-17] N80-25396
Consequences of the mass spectrometric and infrared analysis of oils and asphaltenes for the chemistry of coal liquefaction. Characterization of coal-derived liquids and other fossil fuel related materials employing mass spectrometry
[FE-2537-10] N80-25460
Optimization studies of various coal-conversions systems: Coal dissolution phenomena
[FE-2274-7] N80-25461
Research and development of an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels
[FE-1800-42] N80-25473
EDS coal liquefaction process development, phase 4
[FE-2893-33] N80-25474
EDS coal liquefaction process development, phase 4. EDS commercial plant study design update, offsite design basis: Illinois coal market flexibility sensitivity case
[FE-2893-37] N80-25475

COAL UTILIZATION
Feasibility study of using a coal/water oil emulsion as a clean liquid fuel
[FE-2437-T1-ADD] N80-25483
Flash hydropyrolysis of coal
[BNL-51052] N80-25488
Developmental research program for clean industrial and transportation fuels from coal: Milestone report on comparison of catalysts, March 1979
[FE-2514-M4] N80-25471
Magnetohydrodynamics: A promising technology for efficiently generating electricity from coal, report to the Congress
[PB80-143175] N80-25910
Consequences of increased coal utilization
[CONF-791108-16] N80-25923

COASTAL ECOLOGY
The modeling of aquatic ecosystems of shallow lakes exchanging matter with sediment and with neighboring bodies of water N80-25725
Coastal upswelling ecosystems analysis. Physical dynamics of the coastal upwelling frontal zone off Oregon
[PB80-139843] N80-26024

COASTAL PLAINS
Transport and diffusion climatology of the US Atlantic and Gulf coasts
[BNL-26891] N80-26002

COASTAL WATER
Physical alterations of coastal shorelines: An analysis of Chesapeake Bay shore zone development and regulation
[PB80-149875] N80-25956

COASTS
A regional surface wind model for mountainous coastal areas
[PB80-146152] N80-26014

COATING
Selective paint development — solar energy absorbers
[ALO-4287-T2] N80-25448

COATINGS
Evaluation of hot corrosion behavior of thermal barrier coatings
[NASA-TM-81520] N80-25412

COBALT ALLOYS
Superalloys, Volume 2. Citations from the NTIS data base
[PB80-805831] N80-25436
superalloys, volume 3. Citations from the Engineering Index data base
[PB80-805849] N80-25437
Superalloys, volume 4. Citations from the Engineering Index data base
[PB80-805856] N80-25438

COBOL
CII Honeywell Bull COBOL V-50.124-4
[PB80-146012] N80-26080

COGENERATION
Cogeneration technology alternatives study. Volume 1: Summary report
[NASA-CR-159759] N80-25782
Cogeneration technology alternatives study. Volume 2: Industrial process characteristics
[NASA-CR-159760] N80-25793
Cogeneration technology alternatives study. Volume 4: Heat Sources, balance of plant and auxiliary systems
[NASA-CR-159762] N80-25794
Cogeneration technology alternatives study. Volume 6: Computer data
[NASA-CR-159764] N80-25795

COLD CATHODES
A quick start of high current discharge from a cold LaB6 cathode for neutral beam injection
[IPPJ-453] N80-26159

COLD FLOW TESTS
Design and cold-air test of single-stage uncooled turbine with high work output
[NASA-TP-1680] N80-25337
Cold-air investigation of a 4 1/2 stage turbine with stage-loading factor of 4.86 and high specific work output. 2: Stage group performance
[NASA-TP-1688] N80-25338

COLD FRONTS
A model for modification of the cloud-topped marine boundary layer during cold air outbreak N80-25988

COLD PLASMAS
Effect of ion dynamics on relativistic nonlinear plasma oscillations
[INPE-1704-RPE/122-REV] N80-26151

COLD WATER
Design parameters for solar powered absorption cooling systems with chilled water storage N80-25776

COLORADO
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejobs and South Fork River basins N80-25752
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
CSU Solar House 3: Solar heating and cooling system performance
[COO-30122-3] N80-25806
Solar project description for Perl-Mack Enterprises' single family residences, Denver, Colorado
[SOLAR/1015-79/50] N80-25821
Biogenic hydrocarbon contribution to the ambient air of selected areas - Tulsa; Great Smokey Mountains; Rio Blanco County, Colorado
[PB80-139066] N80-25845

COLUMNS (SUPPORTS)
Dynamic, inelastic buckling analysis of Mark 1 torus support columns
[NUREG-CR-1038] N80-25714

COMBUSTIBLE FLOW
Unsteady aerothermodynamics modeling N80-25488

COMBUSTION CHAMBERS
Analytical and experimental evaluations of the effect of broad property fuels on combustors for commercial aircraft gas turbine engines
[NASA-TM-81496] N80-25454

COMBUSTION EFFICIENCY
Improving the performance and fuel consumption of dual chamber stratified charge spark ignition engines
[COO-4493-5] N80-25669

COMBUSTION PRODUCTS
Combustion research
[LBL-9809] N80-25400
Effects of rocket exhaust products in the thermosphere and ionosphere
[LA-8233-MS] N80-25922

COMBUSTION STABILITY
Unsteady aerothermodynamics modeling N80-25488

COMMERCIAL AIRCRAFT
Flight service evaluation of an advanced composite empennage component on commercial transport aircraft
[NASA-CR-159286] N80-25320

COMMERCIAL ENERGY
EDS coal liquefaction process development, phase 4
[FE-2893-33] N80-25474

Data handbook for the national solar energy demonstration book
[DSE-5216-T4] N80-25873
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 1: Executive summary
[SAN-1483-1/1] N80-25875
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 2, book 1: Commercial plant conceptual design
[SAN-1483-1/2] N80-25876
MHD high performance demonstration experiment
[DOE/ET-2995/5] N80-26172

COMMUNICATION NETWORKS
Shuttle Ku-band and S-band communications implementation study
[NASA-CR-160882] N80-25522
Update: Local area networks
[PB80-152803] N80-25533
The 30/20 GHZ net market assessment
[NASA-CR-159837] N80-26109

COMMUNICATION SATELLITES
Study of advanced communications satellite systems based on SS-FDMA
[NASA-CR-159778] N80-25357
Communication satellite technology: State of the art and development opportunities
[NASA-CR-159877] N80-25358
Non-Gaussian characteristics of the FDM-FM satellite baseband voice channel N80-25516
Satellite television. Citations from the NTIS data base
[PB80-806318] N80-25531
Satellite television transmission. Citations from the Engineering Index data base
[PB80-806319] N80-25532

COMMUNICATION THEORY
Adaptive MSE estimation algorithms N80-26047

COMPILERS
LANAC: A high level language for data acquisition and process control by minicomputers
[INPE-1721-RPE/126] N80-26063
Cii Honeywell Bull COBOL V-53.124-4
[PB80-148012] N80-26080

COMPOSITE MATERIALS
Tungsten and tungsten alloy powder metallurgy. Citations from the NTIS data base
[PB80-806011] N80-25434
Tungsten and tungsten alloy powder metallurgy. Citations from the Engineering Index data base
[PB80-806029] N80-25435
Phenomenological study on reinforcement of elastomers N80-25447
Identification of the elastic characteristics of composite materials by means of vibration tests and a model of discrete conservative calculation N80-26261

COMPOSITE STRUCTURES
Flight service evaluation of an advanced composite empennage component on commercial transport aircraft
[NASA-CR-159296] N80-25320
Sudden stretching of a four layered composite plate
[NASA-CR-159870] N80-25383

COMPOSITION (PROPERTY)
Sputtering of multicomponent surfaces: Surface composition changes under ion bombardment and angular ejection distributions of sputtered species N80-25411
Corrosion of stainless steel, volume 2. Citations from the NTIS data base
[PB80-805906] N80-25442

COMPOUNDING
The use of mechanical alloying in the manufacture of multifilamentary superconductor wire N80-25536

COMPRESSIBLE FLOW
Incompressible fluid flow in collapsible tubes N80-25575
Optical phase distortion due to compressible flow over laser turrets N80-25598

COMPRESSORS
Study of blade aspect ratio on a compressor front stage
[NASA-CR-159556] N80-25333

COMPUTATIONAL FLUID DYNAMICS
A two-dimensional unsteady Euler equation solver for flows in arbitrarily shaped regions using a modular concept N80-25293
Development and validation of a combined rotor fuselage induced flow field computational method — Langley V/STOL tunnel
[NASA-TP-1656] N80-25296
An interaction algorithm for prediction of mean and fluctuating velocities in two-dimensional aerodynamic wake flows
[NASA-CR-3301] N80-25298
Resolution of Navier-Stokes equations by a space-time pseudo-spectral method N80-25487
Unsteady aerothermodynamics modeling N80-25488

COMPUTER ASSISTED INSTRUCTION
Primer on computer graphics programming
[AD-A082732] N80-26073

COMPUTER GRAPHICS
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758
Computer program documentation modified version of the JA70 aerodynamic heating computer program H800 (MINIVER with a DISSPLA plot package
[NASA-CR-160895] N80-26064
DIGIT: The curve digitizing subsystem of the interactive data display system
[AD-A082485] N80-26071
Primer on computer graphics programming
[AD-A082732] N80-26073
User/programmer guide to UCMD 64: Dumping drawing files to tape
[SAND-80-0156] N80-26076
Application of computer and interactive graphics — highway and railroad traffic flow
[PB80-147051] N80-26079
Joint Gaussian probability plot program
[UCID-18513] N80-26106

COMPUTER NETWORKS
Modelling and resource allocation of linearly restricted operating systems
[AD-A082363] N80-26046

COMPUTER PROGRAMMING
Sequential control structure abstractions for programming languages N80-26049
On K-line and K x K block iterative schemes for a problem arising in 3-D elliptic difference equations
[AD-A082390] N80-26065
Military standard, JOVIAL (J73)
[AD-A081927] N80-26066
Primer on computer graphics programming
[AD-A082732] N80-26073
Synthesized structured programming
[AD-A082359] N80-26074

COMPUTER PROGRAMS
Calculation of fluid circulation patterns in the vicinity of submerged jets using ORSMAC
[K/CSD-4] N80-25628
Fly ash erosion in gas turbine materials N80-25659
Rotor-bearing dynamics technology design guide. Part 4: Cylindrical roller bearings
[AD-A082355] N80-25662
Finite element analysis of arc welding
[WAPD-TM-1430] N80-25673
Computer program for elastic analysis of piping systems with special reference to the power piping code B31.1
[MT-135] N80-25697
Users manual: Secondary data reduction programs for the Eclipse S-200/230 shock and vibration measurement systems
[SAND-79-8065] N80-25708
Low power NASA 36 bit time code generator
[NASA-TM-80697] N80-26045
The induction of the syntax of natural language by computer N80-26050
The RSZ BASIC programming language manual
[NASA-TM-80690] N80-26053
Arc program documentation
[NASA-CR-156867] N80-26054
User's guide for Skylab dynamics program, SKYDYN
[NASA-TM-78279] N80-26056
An application of software design and documentation language — Galileo spacecraft command and data subsystem
[NASA-CR-163258] N80-26057
Partitioning multispectral imagery of the Earth resources
[INPE-1678-RPE/111] N80-26060
Computer program documentation modified version of the JA70 aerodynamic heating computer program H800 (MINIVER with a DISSPLA plot package
[NASA-CR-160895] N80-26064
Software quality assurance: One of the software acquisition engineering guidebook series
[AD-A082425] N80-26070
REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program
[AD-A082735] N80-26072
Synthesized structured programming
[AD-A082359] N80-26074
Comparison between results of the HELIOS and MIRVAL computer codes applied to central receiver solar-energy collection
[SAND-79-8266] N80-26075
SIXDOF: A computer program for trajectory simulation of ballistic flight vehicles
[SAND-79-8260] N80-26077
Semiconductor development laboratory computer control software
[SAND-79-1709] N80-26078
Linear equations in general purpose codes for stiff ODEs
[SAND-80-0429] N80-26093
Investigation of routines for inverting block tridiagonal matrices
[SAND-80-8206] N80-26094
Algorithm to integrate systems of nonlinear ordinary differential equations, with application to the advanced Fiper code
[GA-A-15143] N80-26096
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings
[NASA-CR-163229] N80-26205

COMPUTER STORAGE DEVICES
Read only memory optimization for microprogrammed digital computers N80-26044

COMPUTER SYSTEMS PROGRAMS
As-built design specification of the data order processor ORDHDT
[NASA-CR-160894] N80-26065
Some queuing network models of computer systems
[NASA-CR-160893] N80-26082
Research on data analysis in the physical sciences
[COO-2310-6] N80-26111

COMPUTER TECHNIQUES
Computer control for a cladding thickness tester
[DP-1537] N80-25645
Large scale copper vapor laser computer control system
[UCRL-82275] N80-25653
Applications in structural analysis — conference, Nice, Oct. 1978
[ISD-251] N80-25696
Structural layout with stress-displacement and fabrication limits N80-25700

COMPUTERIZED SIMULATION
Transonic flow field analysis for wing-fuselage configurations
[NASA-CR-3243] N80-25295
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163206] N80-25344
Cost-effectiveness measures of replenishment strategies for systems of orbital spacecraft
[AD-A081859] N80-25356
Data generator for a satellite-borne three-axis accelerometer
[AD-A082827] N80-25638
Mathematical model and the dynamic simulation of an electromechanical rotary device
[BOX-613-2376] N80-25667
Simulation and design of solar thermal processes
[COO-2588-T1] N80-25823
Performance measures and standards for air quality simulation models
[PB80-152838] N80-25950

User's manual for biosphere and dose simulation program (BIODOSE)
[UCRL-15186] N80-26037
NDTRAN: Interpreter of dynamic systems N80-26058
A language for simulating dynamic hierarchical systems
[INPE-1728-TDL/024] N80-26061
REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program
[AD-A082735] N80-26072
SIXDOF: A computer program for trajectory simulation of ballistic flight vehicles
[SAND-79-8260] N80-26077
Computerized adaptive performance evaluation
[AD-A082845] N80-26085
The 30/20 GHZ net market assessment
[NASA-CR-159837] N80-26109

CONCENTRATION (COMPOSITION)
An empirical relationship between mesoscale carbon monoxide concentrations and vehicular emission rates
[PB80-138308] N80-25932
Determination of primordial and cosmogenic radioactivity in achondritic meteorites by low-level, gamma-ray spectrometry
[DOE/TIC-11096] N80-26241

CONCENTRATORS
Development of a second-generation concentrating tracking solar collector
[ASE-4480] N80-25851
Use of thin glass reflectors for solar concentrators
[SAND-80-0109C] N80-25857

CONDENSING
Study of experiments on condensation of nitrogen by homogeneous nucleation at states modelling those on the national transonic facility
[NASA-CR-163217] N80-25294

CONFERENCES
Technical evaluation report on the 54th(A) Propulsion and Energetics Panel Meeting on Advanced Control Systems for Aircraft Powerplants
[AGARD-AR-152] N80-25347
Proceedings of the workshop on Stratospheric and Mesospheric Impacts of Satellite Power Systems (SPS)
[CONF-7809197] N80-25363
Update: Local area networks
[PB80-152903] N80-25533
Proceedings of the Aero-Optics Symposium on Electromagnetic Wave Propagation from Aircraft
[NASA-CP-2121] N80-25588
Applications in structural analysis — conference, Nice, Oct. 1978
[ISD-251] N80-25698
Hydrological and ecological models of shallow lakes and reservoirs
[IIASA-CP-78-14] N80-25720
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
Proceedings of the Workshop on Meteorological Effects of Satellite Power System Rectenna Operation and Related Microwave Transmission Problems
[CONF-7808114] N80-26004
The Precipitation Enhancement Project (PEP) — a report on the training workshop on weather modification for meteorologists held in Villadolid, Spain, March 1979
[DFVLR-MITT-79-12] N80-26006

CONFORMAL MAPPING
A comparison of finite difference methods for solving Laplace's equation on curvilinear coordinate systems
[NASA-CR-163236] N80-26089

CONGRESSIONAL REPORTS
A decision by the Secretary of Defense is needed on the AV-8B aircraft program
[PB80-143209] N80-25291
F/A-18 naval strike fighter: Its effectiveness is uncertain
[PB80-143225] N80-25324
Water immersion facility Johnson Space Center
[GPO-54-508] N80-25348
Magnetohydrodynamics: A promising technology for efficiently generating electricity from coal, report to the Congress
[PB80-143175] N80-25910
Agreement governing the activities of states on the Moon and other celestial bodies, parts 1 and 2
[GPO-59-896] N80-26199

CONICAL BODIES
Drag measurements of conical afterbodies at subsonic and transonic speeds
[DFVLR-FB-79-27] N80-25302

CONNECTICUT
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737

CONSERVATION EQUATIONS
Simulation of chemical reaction in a turbulent flow
[ISM-253] N80-25620

CONSTRUCTION MATERIALS
Design and development of a hard tube flexible radiator system
[NASA-CR-160883] N80-25380

CONTAMINANTS
Pollutant emissions from flat-flame burners at high pressures
[NASA-TP-1673] N80-25392
Use of mass spectroscopy for contamination control
[MLM-2586] N80-25405

CONTINENTAL SHELVES
New England shelf/slope experiment. Data report: The moored array
[PB80-151640] N80-26025

CONTINUOUS SPECTRA
Stark effect spectrophone for continuous absorption spectra monitoring
[NASA-CASE-NPO-15102-1] N80-25538

CONTINUUM MECHANICS
Finite element analysis of problems with infinitely distant boundaries
[PB80-149230] N80-26100

CONTROL
Test results on the Frenchman's Reef solar data acquisition and control system
[NASA-CR-161449] N80-25783

CONTROL CONFIGURED VEHICLES
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163206] N80-25344

CONTROL EQUIPMENT
Technical evaluation report on the 54th(A) Propulsion and Energetics Panel Meeting on Advanced Control Systems for Aircraft Powerplants
[AGARD-AR-152] N80-25347

CONTROL THEORY
Some aspects on improvments of a first-order dynamic optimization algorithm
[SAAB-TN-AE-73] N80-25694

CONTROLLABILITY
Measurement of the handling characteristics of two light airplanes
[NASA-TP-1636] N80-25345

CONTROLLED ATMOSPHERES
Design of viewing windows for controlled-atmosphere chambers
[ORNL/TM-6864] N80-25350
Criteria for controlled atmosphere chambers
[ORNL/TM-6865] N80-25351

CONTROLLED FUSION
Laser program, volume 3 — laser fusion
[UCRL-50021-78-VOL-3] N80-25650
Laser program, volume 2 — laser fusion
[UCRL-50021-78-VOL-2] N80-25651
Laser program, volume 1 — laser fusion
[UCRL-50021-78-VOL-1] N80-25652
STARFIRE: A commerical Tokamak reactor
[ANL/FPP/TM-125] N80-26171

CONVECTION
Porous media flow problems: Natural convection and non-Newtonian N80-25579
Liquid water measurements in high elevation continental cumuli
[PB80-143828] N80-26017

CONVECTION CLOUDS
Case studies of convective storms. Case study 4: First echoe case, 27 July 1976
[PB80-143233] N80-26007
Case studies on convective storms. Case study 5: First echo case, 12 July 1978
[PB80-143241] N80-26008
Satellite cloud climatological results, 1978: Comparison to 1976-77
[PB80-148117] N80-26019

CONVECTIVE FLOW
Numerical modeling with a moving coordinate system: Application to flow through porous media — simulation of oil recovery processes N80-25580
An experimental investigation of convection in a fluid that exhibits phase change
[NASA-TM-78277] N80-25613

CONVECTIVE HEAT TRANSFER
A coordinate transformation method for solving a convection phase change problem N80-25572
Natural convective heat transfer in trapezoidal enclosures N80-25573
Finite element analysis of laminar convective heat transfer N80-25574
Determination of friction factors and heat transfer coefficients for flow past artificially roughened surfaces
[DOE/TIC-10283] N80-25629
Convective heat transfer in MHD channels and its influence on channel performance
[CONF-800104-5] N80-26196

CONVERGENCE
Some aspects on improvments of a first-order dynamic optimization algorithm
[SAAB-TN-AE-73] N80-25694

CONVERSION TABLES
Technical manual for engineers and scientists
[PB80-143266] N80-25488

CONVEXITY
Some convexity properties of Euler's gamma function
[MC-ZW-105/78] N80-26099

CONVOLUTION INTEGRALS
The use of negative feedback and convolution integral in the control of nonlinear instability
[INPE-1733-RPE/133-REV] N80-26083

COOLING
Heating and cooling system — for fatigue test specimens
[NASA-CASE-LAR-12393-1] N80-25893

COOLING SYSTEMS
Multi-use geothermal energy system with augmentation for enhanced utilization. A non-electric application of geothermal energy in Susanville, California
[SAN-1740-2] N80-25868

COORDINATE TRANSFORMATIONS
A coordinate transformation method for solving a convection phase change problem N80-25572
Mathematical methods in physics: Tensor analysis 3 — geodesy, Einstein's gravitational law, and the relativistic form of Maxwell equations
[INPE-1648-RPE/102-REV] N80-26088
A comparison of finite difference methods for solving Laplace's equation on curvilinear coordinate systems
[NASA-CR-163236] N80-26089

COPPER
Microwave surface impedance studies on copper at low temperature N80-25407
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432
Large scale copper vapor laser computer control system
[UCRL-82275] N80-25683

COPPER CHLORIDES
A calculation of the pressure dependent energy bands of CuCl
[INPE-1674-RPE/109] N80-26178

CORE FLOW
Nitramine monopropellant deflagration and general nonsteady reacting rocket chamber flows N80-25373

CORONAL HOLES
Solar-geophysical data number 423, part 1. Prompt Reports: Data for October 1979, September 1979
[PB80-148160-SGD-423-PT-1] N80-26244

CORPUSCULAR RADIATION
Aspects of solar wind theories
[INPE 1636-RPE/095] N80-26243

CORRELATION COEFFICIENTS
Confidence interval robustness of correlation coefficient N80-26101

CORRELATION DETECTION
Internal storm motions from a single non-Doppler weather radar
[PB80-143068] N80-26016

CORROSION
Corrosion of stainless steel, volume 2. Citations from the NTIS data base
[PB80-805806] N80-25442
CORROSION PREVENTION
Materials Coating Techniques
[AGARD-LS-106] N80-25499
Corrosion protection by electro-deposited aluminum N80-25505
Applications of sprayed coatings N80-25507
Applications of physical vapor deposition processes N80-25509
CORROSION RESISTANCE
Gas and steam turbines, general: Corrosion and erosion, Volume 2. Citations from the NTIS data base
[PB80-809864] N80-25342
Gas and steam turbines, general: Corrosion and erosion. Citations from the engineering index data base
[PB80-806672] N80-25343
Evaluation of the stress corrosion cracking resistance of several high strength low alloy steels
[NASA-TM-78276] N80-25413
Study of etchants for corrosion-resistant metals, space shuttle external tank
[NASA-CR-161431] N80-25414
Investigation of the mechanical and corrosion properties of MA-87 aluminum powder alloy
[AD-A082457] N80-25418
COSMIC RAYS
Solar-geophysical data numer 423, part 2. Comprehensive Reports. Data for May 1979, March 1979 and miscellanea
[PB80-146179] N80-26245
Abundances and energy spectra of individual elements in the heavy cosmic rays N80-26248
The isotopic composition of cosmic rays N80-26250
COST ANALYSIS
Economic baselines for current underground coal mining technology
[NASA-CR-163259] N80-25784
Analysis of the uncertainties associated with cost estimation
[INPE-1692-TDL/022] N80-26197
COST EFFECTIVENESS
Cost-effectiveness measures of replenishment strategies for systems of orbital spacecraft
[AD-A081859] N80-25356
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25758
COST ESTIMATES
Cost estimating relationships for airframes in the development and production phases
[NASA-TM-80229] N80-26198
COULOMETRY
Surface voltammetry and coulometry of solid electrodes N80-25388
CRAB NEBULA
Is the remnant of SN1006 crab-like?
[NASA-TM-80689] N80-26251
CRACK PROPAGATION
Sudden bending of cracked laminates
[NASA-CR-159860] N80-25384
Influence of Alpha/Beta interface phase on fracture toughness and fatigue crack growth rate in Ti-6Al-4V
[AD-A082456] N80-25417
Stability, toughness, and crack propagation in steel wires and bars
[LPC-89] N80-25716
CRACKING (FRACTURING)
Hydrogen sulphide stress corrosion cracking in materials for geothermal power
[COO-2602-7] N80-25707
CRACKS
Geophysical and hydrologic prediction of fissuring and land subsidence, south-central Arizona
[PB80-151434] N80-25777
CRASHES
Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307
Aircraft survival design guide. Volume 5: Aircraft postcrash survival
[AD-A082513] N80-25308
CREEP ANALYSIS
Hydrogen charging effect on creep of pure iron
[COO-1367-107] N80-25425
CREEP PROPERTIES
Plastic creep flow effects in the diffusive cavitation of grain boundaries
[COO-3084-74] N80-25711
CRITICAL FREQUENCIES
Longitudinal and latitudinal abnormalities in the daily variation of f0F2 in the South American region
[INPE-1722-RPE/127] N80-25969
Comparison of f0F2 characteristics at nearby equatorial locations in the South American region
[INPE-1737-RPE/136] N80-25970
CROSSED FIELDS
The plasma boundary layer and magnetopause layer of the Earth's magnetosphere N80-25959
CRUCIBLES
Single crystal growth of zirconia utilizing a skull melting technique
[AD-A082323] N80-26183
CRUDE OIL
Displacement of oil by carbon dioxide
[DOE/MC-03250/4] N80-25768
Strategic petroleum reserve
[DOE/RA-0047] N80-25769
Remote sensing applied to petroleum and mineral exploration. Citations from the International Aerospace Abstracts data base
[NASA-CR-163311] N80-25770
CRYOGENIC FLUID STORAGE
Liquid hydrogen-fueled vehicle project
[LA-UR-79-2883] N80-25467
CRYOGENIC FLUIDS
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-138472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-138480] N80-26218
CRYOGENIC WIND TUNNELS
Study of experiments on condensation of nitrogen by homogeneous nucleation at states modelling those on the national transonic facility
[NASA-CR-163217] N80-25294
Theoretical study of nonadiabatic boundary-layer stabilization times in a cryogenic wind tunnel for typical stainless steel wing and fuselage models
[NASA-TM-80212] N80-25614
Effects of various assumptions on the calculated liquid fraction in isentropic saturated equilibrium expansions
[NASA-TP-1682] N80-25615
CRYSTAL DISLOCATIONS
Phonon-dislocation interaction
[COO-1198-1281] N80-26126
CRYSTAL GROWTH
Photoelectronic properties of zinc phosphide crystals, films and heterojunctions
[SU-DSE-4042-T18] N80-25547
Analysis and evaluation in the production process and equipment area of the low-cost solar array project
[NASA-CR-163208] N80-25782
Formation and transformation of polytypes in MX2 compounds
[INPE-1735-RPE/135] N80-26177
Single crystal growth of zirconia utilizing a skull melting technique
[AD-A082323] N80-26183
Gallium arsenide epitaxial growth, volume 2. Citations from the NTIS data base
[PB80-805583] N80-26189
Gallium arsenide epitaxial growth, volume 3. Citations from the Engineering Index data base
[PB80-805591] N80-26190
CRYSTAL OSCILLATORS
Research of an optimal configuration for high stability quartz oscillators on board aircraft and missiles N80-26258
CRYSTAL STRUCTURE
Microstructures of structural ceramics N80-25445
Relation between the electronic structure and the shock sensitivity of nitrated secondary explosives. 3: Influence of the crystal environment
[UCRL-TRANS-11510] N80-25458
Formation and transformation of polytypes in MX2 compounds
[INPE-1735-RPE/135] N80-26177
CRYSTALLINITY
Plasma aided techniques N80-25501
CRYSTALLIZATION
Crystallization of ultra-quenched polymer glasses N80-25448
CRYSTALLOGRAPHY
Solid state crystal physics at very low temperatures
[NASA-CR-163240] N80-26181
CUMULUS CLOUDS
Liquid water measurements in high elevation continental cumuli
[PB80-143928] N80-26017
CURRENT DISTRIBUTION
Loop yagi array antennas N80-25517
Power take-off analysis for diagonally connected MHD channels
[CONF-800104-6] N80-26167
CURRENT SHEETS
Nonlinear evolution of the magnetohydrodynamic sheet pinch N80-26148
CURVES (GEOMETRY)
Gas-particle flow in the entry region of a curved pipe
[LBL-9905] N80-25627
Unified higher order path and envelope curvature theories in kinematics N80-26110
CV-990 AIRCRAFT
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25783
CYBERNETICS
Innate and genetic nature of circadian rhythms
[DOE/TIC-11132] N80-26038
CYCLIC LOADS
The rate (time)-dependent behavior of Ti-7Al-2Cb-1Ta titanium alloy at room temperature under quasistatic monotonic and cyclic loading
[AD-A082523] N80-25416
Permanent deformation of cohesionless subgrade material under cyclic loading N80-25692
Mechanical modeling of microstructural instabilities in cyclic viscoplasticity at variable temperatures
[ESA-TT-611] N80-25718
CYLINDRICAL BODIES
Rotor-bearing dynamics technology design guide. Part 4: Cylindrical roller bearings
[AD-A082355] N80-25682
CYLINDRICAL SHELLS
Vibration of cylindrical shells, with and without ring stiffening
[AD-A082524] N80-25701
CZECHOSLOVAKIA
Development and verification of a model for predicting eutrophication trends in Czechoslovakia N80-25726

D

DAMAGE
Aircraft sonic boom: Effects on buildings. Citations from the NTIS data base
[PB80-806334] N80-25304
DATA ACQUISITION
Test results on the Frenchman's Reef solar data acquisition and control system
[NASA-CR-161449] N80-25783
DATA BASES
Browsing in large data bases
[AD-A081987] N80-26194
DATA COMPRESSION
Advanced image compression study
[AD-A082014] N80-25637
DATA CONVERTERS
DIGIT: The curve digitizing subsystem of the interactive data display system
[AD-A082465] N80-26071
DATA LINKS
Non-Gaussian characteristics of the FDM-FM satellite baseband voice channel N80-25516
DATA PROCESSING
Aircraft integrated data systems — conference proceedings, Friedrichshafen, West Germany, 26-27 Sep. 1978
[DFVLR-MITT-79-03] N80-25275

Relations for a flight performance computer
N80-25281

Processing of AIDS flight recorder data for a quick-look with the aid of a hybrid system
N80-25290

Instrumentation and data processing used in Earth Resources Technology Satellites (ERTS), volume 2. Citations from the NTIS data base
[PB80-805740] N80-25771

Initial geomagnetic field model from MAGSAT
[NASA-TM-80679] N80-25967

The RSZ BASIC programming language manual
[NASA-TM-80680] N80-26053

LANAC: A high level language for data acquisition and process control by minicomputers
[INPE-1721-RPE/126] N80-26063

As-built design specification of the data order processor ORDHDT
[NASA-CR-160694] N80-26065

Continuous time series modeling with applications
N80-26108

Research on data analysis in the physical sciences
[COO-2310-6] N80-26111

DATA RECORDING

Solar radiation data forecast and interpolation analysis. Folder 1, part 1: Executive summary. Part 2: Technical analysis (tasks 1 and 2). Part 3: Appendices (tasks 1 and 2)
[COO-4494-1] N80-25982

DATA REDUCTION

An investigation of the feasibility of improving oculometer data analysis through application of advanced statistical techniques
[NASA-CR-163238] N80-26055

Research on data analysis in the physical sciences
[COO-2310-6] N80-26111

DATA STORAGE

REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program
[AD-A082735] N80-26072

DATA TRANSMISSION

Data extraction and calibration of TIROS-N/NOAA radiometers
[PB80-150824] N80-25772

DECISION MAKING

Using representative knowledge to guide decision making in automatic diagnostic systems
[INPE-1686-RPE/117-REV] N80-26033

Analysis of the uncertainties associated with cost estimation
[INPE-1692-TDL/022] N80-26197

DEFENSE PROGRAM

AGARD highlights
[AD-A082960] N80-26262

DEFLAGRATION

Nitramine monopropellant deflagration and general nonsteady reacting rocket chamber flows
N80-25373

DEFORMATION

A presentation for the deformation of a metal including the effects of strain hardening and recrystallization N80-25408

Constitutive equations for polymers undergoing changes in microstructure with deformation
N80-25443

Permanent deformation of cohesionless subgrade material under cyclic loading N80-25692

DEGRADATION

Overlay coatings for gas turbine airfoils
N80-25506

DEIMOS

Images of Mars: The Viking extended mission
[NASA-SP-444] N80-26239

DELAMINATING

Improving delamination resistance of multilayer printed wiring boards
[BDX-613-2413] N80-25548

DELAY LINES

Microwave fiber optics delay line
[AD-A082505] N80-26142

DELPHI METHOD (FORECASTING)

Analysis of the uncertainties associated with cost estimation
[INPE-1692-TDL/022] N80-26197

DELTA MODULATION

Digital sound: An investigation of delta-modulation/pulse-code-modulation -digital conversion
[BBC-RD-1980/3] N80-25518

DELTAS

Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta
[E80-10152] N80-25734

DENSITY MEASUREMENT

Airborne measurement of atmospheric turbulence
N80-25606

Computerized video densitometry method for rapid analysis of infrared photographic images — temperature distribution across a turbine blade
[NASA-TP-1686] N80-25635

DEPOSITION

Evaluation of hot corrosion behavior of thermal barrier coatings
[NASA-TM-81520] N80-25412

Laser surface alloying N80-25504

DESCENT TRAJECTORIES

Parachutes and decelerators, volume 2. Citations from the NTIS data base
[PB80-806946] N80-25305

DESIGN ANALYSIS

Preliminary materials assessment for the Satellite Power System (SPS)
[DOE/ER-0028] N80-25364

Line-focus solar central power systems, phase1
[SAN-0115-140-1] N80-25903

Design of microcomputer adaptive controllers
N80-26081

Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210

DESULFURIZING

Evaluation of physical/chemical coal cleaning and flue gas desulfurization
[PB80-147622] N80-25481

Flue gas desulfurization by the modified citrate process: Report of investigations
[PB80-134836] N80-25940

The use of pH and chloride electrodes for the automatic control of flue gas desulfurization systems
[PB80-138464] N80-25947

DETONATION

Model of burning and detonation in rocket motors
[LA-8141-MS] N80-25374

Introduction to detonation phenomena
[LA-UR-79-2650] N80-25625

DEVELOPING NATIONS

Photovoltaic system costs using local labor and materials in developing countries
[NASA-CR-163218] N80-25785

DIAGNOSIS

Using representative knowledge to guide decision making in automatic diagnostic systems
[INPE-1686-RPE/117-REV] N80-26033

DIAMONDS

Diamond technology study — using diamonds in traveling wave tubes
[AD-A081928] N80-25545

DIAPHRAGMS (MECHANICS)

Theoretical and physical approach to light gage steel shear diaphragms N80-25691

DIELECTRIC PROPERTIES

Particle-initiated breakdown in gas dielectric cable insulation expanded scope program
[EPRI-EL-1264] N80-25553

Mechanical and dielectric properties of optical films
[UCRL-15098] N80-26144

DIELECTRICS

Wave propagation through axially-symmetric dielectric shells
[AD-A082378] N80-25524

DIESEL ENGINES

Diesel exhaust emissions, volume 2. Citations from the NTIS data base
[PB80-805385] N80-25676

Diesel exhaust emission control for motor vehicles, volume 1. Citations from the Engineering Index data base
[PB80-805393] N80-25677

Diesel exhaust emission control for motor vehicles, volume 2. Citations from the Engineering Index data base
[PB80-805401] N80-25678

Diesel exhaust emissions. Citations from the American Petroleum Institute data base
[PB80-805419] N80-25679

DIFFERENCE EQUATIONS

On K-line and K x K block iterative schemes for a problem arising in 3-D elliptic difference equations
[AD-A082390] N80-26086

DIFFERENTIAL EQUATIONS

Application of functional analysis to perturbation theory of differential equations — nonlinear perturbation of the harmonic oscillator
[NASA-TM-81073] N80-26087

Properties of differential equations through different measures
[AD-A082633] N80-26091

Approximation and numerical analysis of nonlinear equations of evolution
[AD-A082452] N80-26092

Linear equations in general purpose codes for stiff ODEs
[SAND-80-0429] N80-26093

Algorithm to integrate systems of nonlinear ordinary differential equations, with application to the advanced Fiper code
[GA-A-15143] N80-26096

Synchronization of weakly coupled relaxation oscillators — starting with Mishchenko's theorem
[MC-TW-180/78] N80-26098

DIFFRACTION PATTERNS

Apodization of optical systems with poor resolving power N80-26139

DIFFUSION

Numerical modeling with a moving coordinate system: Application to flow through porous media — simulation of oil recovery processes N80-25580

Transport and diffusion climatology of the US Atlantic and Gulf coasts
[BNL-26891] N80-26002

DIFFUSION WELDING

Diffusion bonded boron/aluminum spar-shell fan blade
[NASA-CR-159571] N80-25382

DIFFUSIVITY

Anelastic studies of interstitially trapped hydrogen in niobium
[DOE/ER-01198/1299] N80-25427

DIGITAL COMPUTERS

Innovations in digital image processing
[AD-A082048] N80-25639

Read only memory optimization for microprogrammed digital computers N80-26044

DIGITAL DATA

Application of satellite data for snow mapping in Norway N80-25748

DIGIT: The curve digitizing subsystem of the interactive data display system
[AD-A082465] N80-26071

DIGITAL FILTERS

Colored measurement noise digital prefiltering by averaging
[DFVLR-MITT-79-08] N80-25316

DIGITAL SIMULATION

Simulation model of an oligotrophic lake — Lake Onega N80-25726

DIGITAL SYSTEMS

Inherent error in asynchronous digital flight controls
[AD-A082622] N80-25346

A medial axis transformation for grayscale pictures
[AD-A081347] N80-25636

DIGITAL TECHNIQUES

CARFAX: An example of an FM signal generated using digital techniques
[BBC-RD-1980/2] N80-25512

Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737

Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland
N80-25747

An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins
N80-25756

A microprogrammable digital signal processor: Conception, design, application N80-26043

DISASTERS
Applications of remote sensing to emergency management
[AD-A082243] N80-25765

DISPLACEMENT
Displacement of oil by carbon dioxide
[DOE/MC-03269/4] N80-25768

DISPLAY DEVICES
DIGIT: The curve digitizing subsystem of the interactive data display system
[AD-A082485] N80-26071

DISTANCE MEASURING EQUIPMENT
Navaids calibration evaluation with a computer-controlled avionics-data acquisition system N80-25267

DISTRIBUTION FUNCTIONS
Inequalities for joint distribution of quadratic forms
[AD-A083033] N80-26090
Two sample location and scale tests for distributions with the same finite interval of support N80-26100

DISTRICT OF COLUMBIA
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740

DIURNAL VARIATIONS
HCMM: Soil moisture experiment — South Alberta, Canada
[E80-10186] N80-25741
Longitudinal and latitudinal abnormalities in the daily variation of IDF2 in the South American region
[INPE-1722-RPE/127] N80-25969
Equatorial counterelectrojet: Two distinct categories
[INPE-1683-RPE/114] N80-25975

DOMESTIC ENERGY
Solar-assisted heat pump-swimming pool synergistics for domestic heating
[UCRL-83458] N80-25905

DOPED CRYSTALS
Roles of the lower and upper Hubbard bands and the donor-excitonic states in the theory of shallow impurity states in doped semiconductors
[INPE-1684-RPE/115] N80-26180

DOPES
The impurity resistivity of In doped CdS
[INPE-1685-RPE/116-REV] N80-25391

DOPPLER EFFECT
The measurement of turbulence with the burst-type laser Doppler anemometer: Errors and correction methods N80-25589
Investigation leading to the development of an acoustic Doppler slurry flowmeter
[ANL-FE-49622] N80-25840

DOWNWASH
Development and validation of a combined rotor fuselage induced flow field computational method — Langley V/STOL tunnel
[NASA-TP-1656] N80-25296

DRAG
Windtunnel tests of a tubular supersonic inlet for projectiles
[DFVLR-FB-79-26] N80-25367
Analytical and experimental investigation of flow between a smooth stationary disc and a grooved rotating disc N80-25584

DRILLING
Drilling horizontal holes in coal bed from the surface with water jets
[SAND-80-0057C] N80-25766

DROPS (LIQUIDS)
A photographic study of drop formation heat and mass transfer N80-25581
Droplet drag and breakup in shock-wave induced unsteady flows N80-25585
Liquid water measurements in high elevation continental cumuli
[PB80-142928] N80-26017

DUCTILITY
The effect of crack length and side grooves on the ductile fracture toughness properties of ASTM A533 steel
[NUREG-CR-1171] N80-25709

DUST
Assessment of methods for control of fugitive emissions from paved roads
[PB80-139330] N80-25495

DUST COLLECTORS
Dust control for a Borer-type continuous miner using a venturi scrubber on a transfer car
[PB80-144650] N80-25773

DWARF STARS
The dwarf spheroidal galaxy in Draco N80-26221

DYNAMIC CHARACTERISTICS
The dynamic analysis of high-speed flexible cam mechanisms N80-25658

DYNAMIC CONTROL
Optimal linear estimation applied to generate suboptimal numerical solutions for control problems
[INPE-1731-RPE/131] N80-26084

DYNAMIC LOADS
Validity of small scale tests for turret/fairing loads and cavity effects N80-25611
Dynamic, inelastic buckling analysis of Mark 1 torus support columns
[NUREG-CR-1038] N80-25714
Seismic safety margins research program load combination project. Task 3: Load combination methodology development
[UCID-18149] N80-25981

DYNAMIC MODELS
The prediction of solutions to management and engineering problems related to the eutrophication of bodies of water N80-25723
Two examples of the use of hydrodynamic models in ecological studies — Lake Huron and Lake Erie water circulation N80-25724
The modeling of aquatic ecosystems of shallow lakes exchanging matter with sediment and with neighboring bodies of water N80-25725
Development and verification of a model for predicting eutrophication trends in Czechoslovakia N80-25726
The modeling of nutrient exchange between sediment and water N80-25727
Evaluation of available phosphorus models — phosphorus loading in lakes N80-25729
NDTRAN: Interpreter of dynamic systems N80-26058

DYNAMIC PROGRAMMING
Parallel processing algorithms for the identification, estimation and control of nonlinear dynamical systems N80-25534
Some aspects on improvments of a first-order dynamic optimization algorithm
[SAAB-TN-AE-73] N80-25694

DYNAMIC RESPONSE
Aircraft dynamic response to damaged runways
[AGARD-R-685] N80-25325
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327
Parameters affecting aircraft performance on runways in bad condition N80-25328
Rotor-bearing dynamics technology design guide. Part 4: Cylindrical roller bearings
[AD-A082355] N80-25662
Dynamic responses of a multi-layered rectangular plate on viscoelastic foundation due to moving loads N80-25688
Vibration of cylindrical shells, with and without ring stiffening
[AD-A082524] N80-25701

DYNAMIC STABILITY
Stability, toughness, and crack propagation in steel wires and bars
[LPC-99] N80-25716

DYNAMIC STRUCTURAL ANALYSIS
Harmonic excitation of mechanical systems at high frequencies and large accelerators N80-25491
Applications in structural analysis — conference, Nice, Oct. 1978
[ISD-251] N80-25696
Inelastic transient stress analysis for thermal and mechanical loading N80-25699
Numerical bracketing of the Eigenvalues of complex linear structures N80-26260

E

E REGION
Rocket measurements of electron temperature in the E region
[NASA-CR-163210] N80-25864

EARPHONES
Audio systems characteristics and minimum performance standards. Aircraft microphones (except carbon), aircraft headsets and speakers and aircraft audio selector panels and amplifiers
[RTCA-305-79/SC132-54-REV-2] N80-25514

EARTH MOVEMENTS
Geophysical and hydrologic prediction of fissuring and land subsidence, south-central Arizona
[PB80-151434] N80-25777

EARTH RESOURCES
Remote sensing applied to petroleum and mineral exploration. Citations from the International Aerospace Abstracts data base
[NASA-CR-163311] N80-25770
Algorithms for sample classification and image feature selection — remote sensing of Earth resources
[INPE-1718-RPE/124] N80-26059
Partitioning multispectral imagery of the Earth resources
[INPE-1678-RPE/111] N80-26060

EARTH RESOURCES PROGRAM
Instrumentation and data processing used in Earth Resources Technology Satellites (ERTS), volume 2. Citations from the NTIS data base
[PB80-805740] N80-25771

EARTH SATELLITES
Geometry of Orbiting Earth Satellites (GOES)
[AD-A082381] N80-25362

EARTH SURFACE
Examination of the empirical flux-profile models in the atmospheric surface boundary layer
[INPE-1747-RPE/140] N80-25971
On the momentum transport by the stationary waves forced by the topography
[INPE-1720-RPE/125] N80-25980

ECOLOGY
Two examples of the use of hydrodynamic models in ecological studies — Lake Huron and Lake Erie water circulation N80-25724
Ocean thermal energy conversion ecological data report from OSS researcher in Gulf of Mexico, 12-23 July 1977
[LBL-8945] N80-25921
Variations in phytoplankton physiological parameters during transient nitrogen environments N80-26027
Phytoplankton primary production below Arctic Ocean pack ice: An ecosystems analysis N80-26028

ECONOMIC ANALYSIS
Italy: Estimates of future energy/GDP relationships
[ORAU/IEA(M)-79-20] N80-25804
Design study and economic assessment of multi-unit offshore wind energy conversion systems applications. Volume 4: Meteorological and oceanographic surveys
[WASH-2330-78/4-VOL-4] N80-25836
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 2: Apparatus designs and costs
[WASH-2330-78/4-VOL-2] N80-25838

ECONOMIC IMPACT
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756

ECONOMICS
Long-term supply curves for geothermal energy: The impacts of technology
[PNL-3072] N80-25865

ECOSYSTEMS
Hydrological and ecological models of shallow lakes and reservoirs
[IIASA-CP-78-14] N80-25720
Discussion of questions related to hydrophysical and ecological modeling of shallow lakes and reservoirs N80-25721
The modeling of aquatic ecosystems of shallow lakes exchanging matter with sediment and with neighboring bodies of water N80-25725
Simulation model of an oligotrophic lake — Lake Onega N80-25728
Theoretical investigations into the development of an intensively used shallow lake with a river flowing into it N80-25730

EDUCATION
Solar energy project: An overview
[DOE/CS-0124] N80-25883

EFFLUENTS
Evaluation of stationary source particulate measurement methods. Volume 4: Basic oxygen furnaces
[PB80-141833] N80-25937
Research to identify components of energy-related wastes: A state-of-the-art report — environment effects, bibliographies
[PB80-137981] N80-25943

EIGENVALUES
Eigenvalues for unstable resonators with slightly misaligned strip mirrors
[INPE-1736-RPE/137-REV] N80-26140
Numerical bracketing of the Eigenvalues of complex linear structures N80-26280

EINSTEIN EQUATIONS
Mathematical methods in physics: Tensor analysis 3 — geodesy, Einstein's gravitational law, and the relativistic form of Maxwell equations
[INPE-1648-RPE/102-REV] N80-25088

ELASTIC PROPERTIES
The concept of effective stress applied to elasticity and to viscoplasticity in the presence of anisotropic damage
[RAE-LIB-TRANS-2039] N80-25696
Linear-elastic and elastic-plastic fracture mechanics of structural materials
[DFVLR-FB-79-31] N80-25717
Identification of the elastic characteristics of composite materials by means of vibration tests and a model of discrete conservative calculation N80-26261

ELASTIC SCATTERING
Correlation holography: Imaging of atoms when sigma sub (inelastic) sigma sub (elastic)
[DOE/ER-70004/258] N80-25644
Nuclear interactions of low energy lithium ions
[COO-10409-1] N80-26137

ELASTIC WAVES
Elastic-wave radiation from spherical sources — Seismic radiation source
[UCRL-52867] N80-25529

ELASTODYNAMICS
Sudden stretching of a four layered composite plate
[NASA-CR-159870] N80-25383
Sudden bending of cracked laminates
[NASA-CR-159860] N80-25384

ELASTOMERS
Phenomenological study on reinforcement of elastomers N80-25447

ELECTRIC AUTOMOBILES
Near-term hybrid vehicle program, phase 1. Appendix D: Sensitivity analysis report
[NASA-CR-163233] N80-26209

ELECTRIC BATTERIES
Thermophysical properties of inorganic polysulfides — applied to advanced batteries
[COO-10387-01] N80-25401
Comparison of onboard aircraft Nicad battery chargers
[AD-A082515] N80-25540
Electrochemical energy storage on board of road electric vehicles N80-26211

ELECTRIC BRIDGES
Comparison of flying compacitor bridge circuits and inductor-convertor bridge circuits for the transfer of energy between superconducting coils
[CONF-791075-4] N80-25548

ELECTRIC COILS
Comparison of flying compacitor bridge circuits and inductor-convertor bridge circuits for the transfer of energy between superconducting coils
[CONF-791075-4] N80-25548

ELECTRIC DISCHARGES
A quick start of high current discharge from a cold LaB6 cathode for neutral beam injection
[IPPJ-453] N80-26159

ELECTRIC EQUIPMENT TESTS
Minimum performance standards: Airborne Omega receiving equipment
[RTCA/DO-184A] N80-25310
EPS analysis of nominal STS-1 flight
[NASA-TM-81001] N80-25368

ELECTRIC GENERATORS
Climate program plan, volume 1 — effects of energy technologies on climate and environment
[DOE/EV-0062/1] N80-26003

ELECTRIC HYBRID VEHICLES
Design study of toroidal traction CVT for electric vehicles
[NASA-CR-159803] N80-25661
Near hybrid passenger vehicle development program, phase 1. Appendices A and B. Mission analysis and performance specification studies report, volume 1
[NASA-CR-163330] N80-26201
Near hybrid passenger vehicle development program, phase 1. Appendices C and D, Volume 2
[NASA-CR-163331] N80-26202
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies — various hybrid/electric power train configurations and electrical and mechanical drive-line components
[NASA-CR-163227] N80-26203
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies
[NASA-CR-163228] N80-26204
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings
[NASA-CR-163229] N80-26205
Near-term hybrid vehicle program, phase 1
[NASA-CR-163230] N80-26206
Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report
[NASA-CR-163231] N80-26207
Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package
[NASA-CR-163232] N80-26208
Near-term hybrid vehicle program, phase 1. Appendix D: Sensitivity analysis report
[NASA-CR-163233] N80-26209
Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210
Advanced propulsion system for hybrid vehicles
[NASA-CR-159771] N80-26212
Development of fuel cell technology for vehicular applications
[BNL-51047] N80-26218

ELECTRIC MOTOR VEHICLES
Design study of toroidal traction CVT for electric vehicles
[NASA-CR-159603] N80-25661
Pulse charging of lead-acid traction cells
[NASA-TM-81513] N80-25780
Research, development and demonstration of lead-acid batteries for electric vehicle propulsion
[ANL/OEPM-78-8] N80-25801
Research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion
[ANL/OEPM-78-11] N80-25802
Mathematical modeling of the lithium aluminum, iron sulfide battery
[LBL-10197] N80-25845
Evaluation of air cathodes for potential use in development of aluminum-air cells
[UCID-18561] N80-25893
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies — various hybrid/electric power train configurations and electrical and mechanical drive-line components
[NASA-CR-163227] N80-26203
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies
[NASA-CR-163228] N80-26204
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings
[NASA-CR-163229] N80-26205
Near-term hybrid vehicle program, phase 1
[NASA-CR-163230] N80-26206
Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report
[NASA-CR-163231] N80-26207
Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package
[NASA-CR-163232] N80-26208
Near-term hybrid vehicle program, phase 1. Appendix D: Sensitivity analysis report
[NASA-CR-163233] N80-26209
Electrochemical energy storage on board of road electric vehicles N80-26211
Energy-storage systems for automobile propulsion, 1979 study. Volume 3: Battery/flywheel electric vehicles using advanced batteries
[UCRL-52841-VOL-3] N80-26213
Advanced subsystems for practical electric vehicles. Electric and Hybrid Vehicle Subsystems Technology Development Program
[DOE/CS-0102/1] N80-26214

ELECTRIC POTENTIAL
The electrostatic potential of an equatorial satellite
[INPE-1749-RPE/142-REV] N80-25359
Magnetopause reconnection
[INPE-1667-RPE/108] N80-25973

ELECTRIC POWER PLANTS
Compact closed cycle Brayton system feasibility study, volume 1 — marine propulsion
[AD-A081379] N80-25666
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 4: Commerical and pilot plant cost data
[SAN-1483-1/5] N80-25803
Systems engineering for power: Organizational forms for large scale systems, volume 1
[CONF-790904-P2] N80-25808
Conceptual design and analysis of a 100 MWe distributed line focus solar central power plant
[SAN-2073-1] N80-25826
Beneficial use of rejected heat from electric power plants
[COO-4531-9] N80-25841
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 1: Executive summary
[SAN-1483-1/1] N80-25875
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 2, book 1: Commercial plant conceptual design
[SAN-1483-1/2] N80-25876
Reliability, energy and cost effects of wind integration with conventional electrical generating systems
[CONF-791204-32] N80-25894
Pollutant measurements in plumes from power plants and cities - St. Louis area, July 1976. A project MISTT (midwest sulfur transformation and transport) report
[PB80-139058] N80-25935

ELECTRIC POWER SUPPLIES
EPS analysis of nominal STS-1 flight
[NASA-TM-81001] N80-25368

ELECTRIC POWER TRANSMISSION
Systems engineering for power: Organizational forms for large scale systems, volume 1
[CONF-790904-P2] N80-25808

ELECTRICAL INSULATION
Radiation effects on organic insulators for superconducting magnets
[ORNL/TM-7077] N80-25551

ELECTRICAL RESISTIVITY
The impurity resitivity of In doped CdS
[INPE-1685-RPE/116-REV] N80-25391

ELECTRICITY
Magnetohydrodynamics: A promising technology for efficiently generating electricity from coal, report to the Congress
[PB80-143175] N80-25910

ELECTRO-OPTICS
An electro-optical ion detector for spark source mass spectrometry N80-25389
High repetition rate electro-optic Q-switching of Nd(3+):YAG lasers showing strong optical birefringence
[IPF-79-6] N80-25856

ELECTROCHEMISTRY
Relationship of the geometry of the observed steady state chemical conversion rate to the basic surface reaction process in electrochemistry
[ISM-243] N80-25397
Electrochemical properties of certain new ternary and quaternary alloys based on aluminum
[UCRL-TRANS-11535] N80-25431

ELECTRODEPOSITION
Materials Coating Techniques
[AGARD-LS-106] N80-25499
Corrosion protection by electro-deposited aluminum N80-25505

ELECTRODES

Electrode polarization studies in hot corrosion systems
[COO-2960-4] N80-25433

Oxygen reduction on a graphite paste and a catalyst loaded graphite paste electrode
[IS-T-986] N80-25899

The use of pH and chloride electrodes for the automatic control of flue gas desulfurization systems
[PB80-139484] N80-25947

ELECTROLYTES

Journal of research of the National Bureau of Standards, volume 85, no. 1 — aqueous electrolytes, iridium-192 gamma ray sources, air density at differing altitude, and isotopic abundance of thallium
[PB80-146586] N80-25377

New electrolytes for direct methane fuel cells
[DOE/ET-11321/T1] N80-25891

Advanced fuel cell development
[ANL-79-51] N80-25895

ELECTROMAGNETIC COMPATIBILITY

Radar Microwave Link (RML) electromagnetic compatibility measurements
[AD-A083072] N80-25523

ELECTROMAGNETIC FIELDS

Missile circumferential current density for plane wave electromagnetic field illumination
[AD-A082763] N80-25526

ELECTROMAGNETIC INTERACTIONS

X-rays from active galactic nuclei: Emission mechanisms and interaction with ambient media
N80-26247

ELECTROMAGNETIC RADIATION

Wave propagation through axially-symmetric dielectric shells
[AD-A082378] N80-25824

ATS-6 measurements during AVEFRIA
[AD-A082192] N80-25825

Waves in an ultra-relativistic electron-positron plasma
[IPPJ-450] N80-26157

Optical mixing as a plasma diagnostic
[LA-8262-MS] N80-26170

Contribution to the study of electrostatic and electromagnetic waves near the lower hybrid frequency in ionospheric plasma
[CRPE-NT-61] N80-26173

ELECTROMAGNETIC SPECTRA

Spectrum of acoustic waves excited in single and multiple layered crystalline media N80-26174

ELECTROMAGNETIC WAVE TRANSMISSION

Proceedings of the Aero-Optics Symposium on Electromagnetic Wave Propagation from Aircraft
[NASA-CP-2121] N80-25588

The effect of atmospheric particulate matter on the propagation of a laser beam
[AD-A083030] N80-25648

ELECTROMECHANICAL DEVICES

Mathematical model and the dynamic simulation of an electromechanical rotary device
[BDIX-613-2376] N80-25867

ELECTRON BEAM WELDING

Electron beam welding, volume 2. Citations from the NTIS data base
[PB80-805871] N80-25674

Electron beam welding, volume 2. Citations from the Engineering Index data base
[PB80-805989] N80-25675

ELECTRON BEAMS

Overlay coatings for gas turbine airfoils
N80-25506

Electron beam semiconductor devices. Citations from the NTIS data base
[PB80-805897] N80-25555

Electron beam semiconductor devices. Citations from the Engineering Index data base
[PB80-806003] N80-25556

Polarized LEED study of surface magnetism
[CONF-790909-15] N80-26187

ELECTRON DENSITY (CONCENTRATION)

Thermodynamic properties of extended Hubbard model with strong intraatomic attraction and arbitrary electron density
[INPE-1726-NTE/158-REV] N80-26124

ELECTRON DENSITY PROFILES

Spaced lidar and nightglow observations of an atmospheric sodium enhancement
[INPL 1675-RPE/110] N80-25974

ELECTRON DIFFUSION

New type of ray trajectory of thermal mode in an inhomogeneous magnetoplasma
[IPPJ-447] N80-26154

ELECTRON ENERGY

Rocket measurements of electron temperature in the E region
[NASA-CR-163210] N80-25964

Moller-Plesset electron correlation studies of atoms and small molecules N80-26120

ELECTRON SCATTERING

Electron-photon interactions in piezoelectric semiconductors for the phase insensitive detection of ultrasound N80-26113

ELECTRON STATES

Relativistic many body perturbation theory. Application to spin-Hamiltonian parameters of atoms and ions with half-filled shells N80-26119

ELECTRON TUBES

Nanosecond pulsers for MM wave tubes
[AD-A080966] N80-25542

ELECTRON TUNNELING

Fabrication and diagnostics of oxide tunneling barriers in niobium based superconductive tunnel junctions N80-26176

ELECTRONIC EQUIPMENT

Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 1
[AD-A081233] N80-25314

Recommendations on policies and procedures for off-the-shelf electronic test equipment acquisition and support
[RTCA-307-79/SC134-69] N80-25535

Test results on the Frenchman's Reef solar data acquisition and control system
[NASA-CR-161449] N80-25783

Power take-off analysis for diagonally connected MHD channels
[CONF-800104-6] N80-26167

ELECTRONIC PACKAGING

Improving delamination resistance of multilayer printed wiring boards
[BDIX-613-2413] N80-25548

ELECTRONS

Cross sections for electron and photon processes required by electron-transport calculations
[SAND-79-0772] N80-26186

ELECTROSTATIC WAVES

Contribution to the study of electrostatic and electromagnetic waves near the lower hybrid frequency in ionospheric plasma
[CRPE-NT-61] N80-26173

ELECTROSTATICS

The electrostatic potential of an equatorial satellite
[INPE-1749-RPE/142-REV] N80-25358

Ion extraction from a plasma
[NASA-CR-159849] N80-26161

ELEVATORS (CONTROL SURFACES)

Experimental and analytical transonic flutter characteristics of a geared-elevator configuration
[NASA-TP-1666] N80-25321

ELLIPSOIDS

Use of auxiliary ellipsoids in height-controlled spatial adjustments
[PB80-155104] N80-25776

ELLIPTIC DIFFERENTIAL EQUATIONS

A comparison of finite difference methods for solving Laplace's equation on curvilinear coordinate systems
[NASA-CR-163236] N80-26089

EMBRITTLEMENT

Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-64] N80-25428

EMERGENCIES

Aircraft survival design guide. Volume 5: Aircraft postcrash survival
[AD-A082513] N80-25308

Applications of remote sensing to emergency management
[AD-A082243] N80-25765

EMISSION

Pollutant emissions from flat-flame burners at high pressures
[NASA-TP-1673] N80-25392

EMISSION SPECTRA

The discovery of optical emission from the SNR G 126.2 + 1.6
[NASA-TM-80708] N80-26228

EMISSIVITY

X-rays from active galactic nuclei: Emission mechanisms and interaction with ambient media
N80-26247

EMULSIONS

Feasibility study of using a coal/water oil emulsion as a clean liquid fuel
[FE-2437-T1-ADD] N80-25463

ENCLOSURES

Natural convective heat transfer in trapezoidal enclosures N80-25573

ENERGY ABSORPTION

Energy dissipation of Rayleigh waves due to absorption along the path of the use of finite-element method N80-25961

ENERGY BANDS

A calculation of the pressure dependent energy bands of CuCl
[INPE-1674-RPE/109] N80-26178

Roles of the lower and upper Hubbard bands and the donor-excitonic states in the theory of shallow impurity states in doped semiconductors
[INPE-1684-RPE/115] N80-26180

ENERGY BUDGETS

An energy-balance climate model with separate land and oceanic effects N80-25962

La Recherche Aerospatiale, Bimonthly Bulletin Number 1979-6
[ESA-TT-632] N80-26255

BIRAMIS: Direct measurement of the Earth radiation budget by means of an accelerometer in space
N80-26256

ENERGY CONSERVATION

Evaluation of residential building energy performance standards
[LBL-9816] N80-25849

Site and building energy-conservation study: Survey of building 251, diagnostic chemistry
[UCRL-15190] N80-25880

International analysis of residential energy use and conservation
[LBL-9383] N80-25881

Proposed energy performance standards for new buildings: Standard building operating conditions
[DOE/CS-0118] N80-25901

Proposed energy-performance standards for new buildings: Passive and active solar-heating analysis
[DOE/CS-0117] N80-25902

ENERGY CONSUMPTION

Evaluation of residential building energy performance standards
[LBL-9816] N80-25849

Site and building energy-conservation study: Survey of building 251, diagnostic chemistry
[UCRL-15190] N80-25880

International analysis of residential energy use and conservation
[LBL-9383] N80-25881

Proposed energy performance standards for new buildings: Standard building operating conditions
[DOE/CS-0118] N80-25901

Proposed energy-performance standards for new buildings: Passive and active solar-heating analysis
[DOE/CS-0117] N80-25902

ENERGY CONVERSION

Preparation of a coal conversion systems technical data book
[FE-2286-44] N80-25472

Compact closed cycle Brayton system feasibility study, volume 1 — marine propulsion
[AD-A081379] N80-25666

Cogeneration technology alternatives study. Volume 1: Summary report
[NASA-CR-159759] N80-25792

Cogeneration technology alternatives study. Volume 2: Industrial process characteristics
[NASA-CR-159760] N80-25793

Cogeneration technology alternatives study. Volume 4: Heat Sources, balance of plant and auxiliary systems
[NASA-CR-159762] N80-25794

Cogeneration technology alternatives study. Volume 6: Computer data
[NASA-CR-159764] N80-25795

Potential applications of biomass technology at National Technology Laboratories and Mississippi Army Ammunition Plant
[AD-A082756] N80-25797

Design study and economic assessment of multi-unit offshore wind energy conversion systems applications. Volume 4: Meteorological and oceanographic surveys
[WASH-2330-78/4-VOL-4] N80-25836

Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 3: System analysis
[WASH-2330-78/4-VOL-3] N80-25837

New developments in wind systems technology
[RFP-3000] N80-25888

Technical and management support for the development of small wind systems
[RFP-2974/3533-79-2] N80-25889

Risk of renewable energy sources: A critique of the inhaber report
[ERG-79-3] N80-25892

Aerodynamic interference between two Darrieus wind turbines
[SAND-79-1984C] N80-25897

Design and fabrication of a low-cost Darrieus vertical axis wind turbine system, phase 1
[ALO-4272] N80-25899

Biosources digest, a journal on biomass utilization, volume 1, no. 1
[PB80-140973] N80-25908

Biosources digest: A journal on biomass utilization, volume 1, no. 4
[PB80-140981] N80-25909

Environmental assessments of alternative energy strategies in the United States
[CONF-791172-1] N80-25927

Environmental assessment of small wind systems
[SERI/PR-354-420] N80-25928

ENERGY CONVERSION EFFICIENCY

CSU Solar House 3: Solar heating and cooling system performance
[COO-30122-3] N80-25806

High temperature hydrogen cycles for solar heat sources
[LA-UR-80-184] N80-25817

Solar technology application to enhanced oil recovery
[SERI/TR-352-392] N80-25839

Novel solar cell concentrator photovoltaic converter system
[SAND-79-7048] N80-25843

Magnetohydrodynamics: A promising technology for efficiently generating electricity from coal, report to the Congress
[PB80-143175] N80-25910

An open cycle turbine solar thermal power system
N80-26257

ENERGY DISSIPATION

Energy dissipation of Rayleigh waves due to absorption along the path of the use of finite-element method N80-25861

ENERGY POLICY

Economic baselines for current underground coal mining technology
[NASA-CR-163259] N80-25764

Thermal energy storage
[NASA-TM-81514] N80-25779

Solar heating and cooling demonstration project at Radian Corporation, Austin, Texas
[NASA-CR-161442] N80-25784

Solar heating system installed at Telex Communications, Inc., Blue Earth, Minnesota
[NASA-CR-161437] N80-25786

Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161450] N80-25787

Solar heating and hot water system installed at Municipal Building complex, Abbeville, South Carolina
[NASA-CR-161443] N80-25788

Solar energy system performance evaluation: Seasonal report for IBM system 1A, Huntsville, Alabama
[NASA-CR-161464] N80-25790

Solar energy system performance evaluation: Seasonal report for Solaron-Akron, Akron, Ohio
[NASA-CR-161465] N80-25791

Cogeneration technology alternatives study. Volume 1: Summary report
[NASA-CR-159759] N80-25792

Cogeneration technology alternatives study. Volume 2: Industrial process characteristics
[NASA-CR-159760] N80-25793

Cogeneration technology alternatives study. Volume 4: Heat Sources, balance of plant and auxiliary systems
[NASA-CR-159762] N80-25794

Cogeneration technology alternatives study. Volume 6: Computer data
[NASA-CR-159764] N80-25795

Passive solar calculation methods
[DSE-5221-T1] N80-25798

OTEC support services
[COO-4931-T11] N80-25799

Solar photovoltaic flat panel applications experiment at the Oklahoma Center for Science and Arts
[DOE/ET-23063/1] N80-25800

CSU Solar House 3: Solar heating and cooling system performance
[COO-30122-3] N80-25806

Solar project description for Perl-Mack Enterprises' single family residences, Denver, Colorado
[SOLAR/1015-79/50] N80-25821

West Chester Work Center: Solar space heating demonstration project
[DOE/CS-4048/2] N80-25822

Solar total energy project Shenandoah
[ALO-3985-1-REV-1] N80-25825

Beneficial use of rejected heat from electric power plants
[COO-4531-9] N80-25841

Novel solar cell concentrator photovoltaic converter system
[SAND-79-7048] N80-25843

Evaluation of residential building energy performance standards
[LBL-9816] N80-25849

Solar collector studies for solar heating and cooling applications
[ALO-5355-T1] N80-25850

Solar energy conversion through biophotolysis
[SAN-0034-239-T1] N80-25852

Long-term supply curves for geothermal energy: The impacts of technology
[PNL-3072] N80-25865

Two-tank seasonal storage concept for solar space heating of buildings
[CONF-791226-2] N80-25867

Evaluation of reliability of operational solar-energy systems
[CONF-791105-2] N80-25872

Optimization of solar assisted heat pump systems via a simple analytic approach
[BNL-27316] N80-25896

Proposed energy performance standards for new buildings: Standard building operating conditions
[DOE/CS-0118] N80-25901

Proposed energy-performance standards for new buildings: Passive and active solar-heating analysis
[DOE/CS-0117] N80-25902

SAGE, Solar Assisted Gas Energy
[PB80-153836] N80-25907

Novel concentrator photovoltaic converter system development
[SAND-80-7004] N80-25912

Consequences of increased coal utilization
[CONF-791108-16] N80-25923

Division of Environmental Control Technology program, 1978
[DOE/EV-0042] N80-25926

Near hybrid passenger vehicle development program, phase 1. Appendices A and B. Mission analysis and performance specification studies report, volume 1
[NASA-CR-163330] N80-26201

Near hybrid passenger vehicle development program, phase 1. Appendices C and D, Volume 2
[NASA-CR-163331] N80-26202

Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210

ENERGY REQUIREMENTS

Italy: Estimates of future energy/GDP relationships
[ORAU/IEA(M)-79-20] N80-25804

ENERGY SOURCES

World Energy Data System (WENDS). Volume 1: Country data, AF-CO
[ANL/PMS-79-2-VOL-1] N80-25827

World Energy Data System (WENDS). Volume 2: Country data, CZ-KS
[ANL/PMS-79-2-VOL-2] N80-25828

World Energy Data System (WENDS). Volume 2: Country data, LY-PO
[ANL/PMS-79-2-VOL-3] N80-25829

World energy data system (Wends). Volume 4: Country data, SG-YO
[ANL/PMS-79-2-VOL-4] N80-25830

World Energy Data System (WENDS). Volume 5: International organization data
[ANL/PMS-79-2-VOL-5] N80-25831

ENERGY SPECTRA

Abundances and energy spectra of individual elements in the heavy cosmic rays N80-26248

ENERGY STORAGE

Design parameters for solar powered absorption cooling systems with chilled water storage
N80-25778

Research, development and demonstration of lead-acid batteries for electric vehicle propulsion
[ANL/OEPM-78-8] N80-25801

Research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion
[ANL/OEPM-78-11] N80-25802

Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 4: Commerical and pilot plant cost data
[SAN-1483-1/5] N80-25803

Superconducting Magnetic Energy Storage (SMES) program
[LA-8199-PR] N80-25805

Mathematical modeling of the lithium aluminum, iron sulfide battery
[LBL-10197] N80-25845

Development of a practical photochemical energy storage system. The norbornadiene-quadricyclene energy storage system
[SRO-0693-17] N80-25869

Preliminary development of the Band Type Variable Inertia Flywheel (BVIF)
[SAND-79-7068] N80-25879

Advanced fuel cell development
[ANL-79-51] N80-25895

Electrochemical energy storage on board of road electric vehicles N80-26211

Energy-storage systems for automobile propulsion, 1979 study. Volume 3: Battery/flywheel electric vehicles using advanced batteries
[UCRL-52841-VOL-3] N80-26213

ENERGY TECHNOLOGY

The solar power satellite concepts: The past decade and the next decade
[NASA-TM-81000] N80-25369

Thermochemical conversion of biomass: An overview of R and D activities sponsored by the biomass energy systems branch of DOE
[PNL-SA-8265] N80-25465

Conversion of biomass materials into gaseous products. Operation of the POU
[SAN-1241-3] N80-25466

Environmental control technology for biomass flash pyrolysis
[CONF-800129-2] N80-25477

Thermal energy storage
[NASA-TM-81514] N80-25779

Photovoltaic system costs using local labor and materials in developing countries
[NASA-CR-163218] N80-25785

OTEC support services
[COO-4931-T11] N80-25799

Research, development and demonstration of lead-acid batteries for electric vehicle propulsion
[ANL/OEPM-78-8] N80-25801

Research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion
[ANL/OEPM-78-11] N80-25802

Superconducting Magnetic Energy Storage (SMES) program
[LA-8199-PR] N80-25805

Ocean energy systems. Fiscal year 1979
[DOE/ET-0118] N80-25824

World Energy Data System (WENDS). Volume 1: Country data, AF-CO
[ANL/PMS-79-2-VOL-1] N80-25827

World Energy Data System (WENDS). Volume 2: Country data, CZ-KS
[ANL/PMS-79-2-VOL-2] N80-25828

World Energy Data System (WENDS). Volume 2: Country data, LY-PO
[ANL/PMS-79-2-VOL-3] N80-25829

World energy data system (Wends). Volume 4: Country data, SG-YO
[ANL/PMS-79-2-VOL-4] N80-25830
World Energy Data System (WENDS). Volume 5: International organization data
[ANL/PMS-79-2-VOL-5] N80-25831
Solar technology application to enhanced oil recovery
[SERI/TR-352-382] N80-25839
Solar energy conversion through biophotolysis
[SAN-0034-239-T1] N80-25852
Magma energy: A feasible alternative?
[SAND-80-0309C] N80-25859
Hybrid thermal storage with water
[ESG-DOE-13259] N80-25861
Environmental development plan: Solar agricultural and industrial process heat
[DOE/EDP-0033] N80-25862
Comparative performance of two types of evacuated tubular solar collectors in a residential heating and cooling system
[COO-2577-19] N80-25864
Long-term supply curves for geothermal energy: The impacts of technology
[PNL-3072] N80-25865
Data handbook for the national solar energy demonstration book
[DSE-5216-T4] N80-25873
Photovoltaic energy systems. Program summary
[DOE/CS-0146] N80-25894
New developments in wind systems technology
[RFP-3000] N80-25898
Risk of renewable energy sources: A critique of the Inhaber report
[ERG-79-3] N80-25892
Line-focus solar central power systems, phase1
[SAN-0115-140-1] N80-25903
Solar energy program. Chapter from the Energy and Environment Division report
[LBL-9630] N80-21904
SAGE, Solar Assisted Gas Energy
[PB80-144363] N80-25908
Magnetohydrodynamics: A promising technology for efficiently generating electricity from coal, report to the Congress
[PB80-143175] N80-25910
Novel concentrator photovoltaic converter system development
[SAND-80-7004] N80-25912
Division of Environmental Control Technology program, 1978
[DOE/EV-0042] N80-25926
Environmental assessments of alternative energy strategies in the United States
[CONF-791172-1] N80-25927
Research to identify components of energy-related wastes: A state-of-the-art report — environment effects, bibliographies
[PB80-137961] N80-25943
Solar radiation data forecast and interpolation analysis. Folder 1, part 1: Executive summary. Part 2: Technical analysis (tasks 1 and 2). Part 3: Appendices (tasks 1 and 2)
[COO-4494-1] N80-25962
Climate program plan, volume 1 — effects of energy technologies on climate and environment
[DOE/EV-0062/1] N80-26003
MHD high performance demonstration experiment
[DOE/ET-2895/5] N80-26172

ENERGY TRANSFER

Comparison of flying capacitor bridge circuits and inductor-convertor bridge circuits for the transfer of energy between superconducting coils
[CONF-791075-4] N80-25546
A photographic study of drop formation heat and mass transfer N80-25581
Vibrational energy transfer by molecular collisions at high temperatures utilizing the diffusion cloud technique N80-26123

ENGINE CONTROL

Technical evaluation report on the 54th(A) Propulsion and Energetics Panel Meeting on Advanced Control Systems for Aircraft Powerplants
[AGARD-AR-152] N80-25347

ENGINE DESIGN

High bypass turbofan component development. Phase 1: Fan detail design
[AD-A082521] N80-25336
Design and cold-air test of single-stage uncooled turbine with high work output
[NASA-TP-1690] N80-25337
Cold-air investigation of a 4 1/2 stage turbine with stage-loading factor of 4.86 and high specific work output. 2: Stage group performance
[NASA-TP-1688] N80-25338
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies — various hybrid/electric power train configurations and electrical and mechanical drive-line components
[NASA-CR-163227] N80-26203
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies
[NASA-CR-163228] N80-26204
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings
[NASA-CR-163229] N80-26205
Near-term hybrid vehicle program, phase 1
[NASA-CR-163230] N80-26206
Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report
[NASA-CR-163231] N80-26207
Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package
[NASA-CR-163232] N80-26208

ENGINE FAILURE

Engine parameter trend analysis by LEADS 200: Possibilities and limitations N80-25277
Investigations on local fault detection at turbojet engines N80-25278
Localization of faults in jet engines by calculation of component characteristics N80-25279

ENGINE MONITORING INSTRUMENTS

Investigations on local fault detection at turbojet engines N80-25278
The Engine Usage Monitoring System (EUMS): An heuristic approach to cost effective flight data monitoring and analysis N80-25280
Relations for a flight performance computer N80-25281
Classification of operating conditions of turbomachines from solid borne sound N80-25282
Reduction of measured data and a method of early detection of sensor breakdown N80-25283
An Automatic Fault Indentification System (AFIS) on board N80-25289

ENGINE NOISE

USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915
USAF bioenvironmental noise data handbook. Volume 144: F-106A in-flight crew noise
[AD-A081846] N80-25916
USAF bioenvironmental noise data handbook. Volume 145: F-106B in-flight crew noise
[AD-A081847] N80-25917
USAF bioenvironmental noise data handbook. Volume 146: F-16B in-flight crew noise
[AD-A081848] N80-25918

ENGINE PARTS

Engine component improvement: Performance improvement, JT9D-7 3.8 AR fan
[NASA-CR-159806] N80-25332

ENGINE TESTS

Engine component improvement: Performance improvement, JT9D-7 3.8 AR fan
[NASA-CR-159806] N80-25332
Static and transient performance of YF-102 engine with up to 14 percent core airbleed for the quiet short-haul research aircraft
[NASA-TP-1692] N80-25339

ENTHALPY

Journal of research of the National Bureau of Standards, volume 85, no. 1 — aqueous electrolytes, iridium-192 gamma ray sources, air density at differing altitude, and isotopic abundance of thallium
[PB80-148566] N80-25377

ENVIRONMENT EFFECTS

Calculation of fluid circulation patterns in the vicinity of submerged jets using ORSMAC
[K/CSD-4] N80-25626
Preliminary environmental assessment for the Satellite Power System (SPS), revision 1. Volume 1: Executive summary
[DOE/ER-0036/1] N80-25874
Risk of renewable energy sources: A critique of the Inhaber report
[ERG-79-3] N80-25892
Effects of rocket exhaust products in the thermosphere and ionosphere
[LA-8233-MS] N80-25922
Consequences of increased coal utilization
[CONF-791108-16] N80-25923
Environmental assessments of alternative energy strategies in the United States
[CONF-791172-1] N80-25927
Environmental assessment of small wind systems
[SERI/PR-354-420] N80-25928
Environmental assessment: Geothermal energy geopressure subprogram. DOE Sweet Lake no. 1, Cameron Parish, Louisiana
[DOE/EA-0085] N80-25929
Research to identify components of energy-related wastes: A state-of-the-art report — environment effects, bibliographies
[PB80-137961] N80-25943
Climate program plan, volume 1 — effects of energy technologies on climate and environment
[DOE/EV-0062/1] N80-26003

ENVIRONMENT POLLUTION

Consequences of increased coal utilization
[CONF-791108-16] N80-25923
A diffusion climatology for Cape Canaveral, Florida
[NASA-TM-58224] N80-25994

ENVIRONMENT PROTECTION

Environmental control technology for biomass flash pyrolysis
[CONF-800129-2] N80-25477
Division of Environmental Control Technology program, 1978
[DOE/EV-0042] N80-25926
Compliance status of major air pollution facilities
[PB80-154560] N80-25952
Particulate sampling and support: Executive summary
[PB80-149883] N80-25958

ENVIRONMENTAL ENGINEERING

Environmental development plan: Solar agricultural and industrial process heat
[DOE/EDP-0033] N80-25862
Division of Environmental Control Technology program, 1978
[DOE/EV-0042] N80-25926

ENVIRONMENTAL MONITORING

Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747

ENVIRONMENTAL QUALITY

Solar energy program. Chapter from the Energy and Environment Division report
[LBL-9630] N80-25904

ENVIRONMENTAL TESTS

Environmental conditions and test procedures for airborne equipment
[RTCA-309-79/SC135-41] N80-25329

ENZYMES

Biological and synthetic systems for production of hydrogen from water — using hydrogenase with algae, chloroplasts, or synthetic catalysts
[PB80-146269] N80-25480

EPITAXY

Gallium arsenide epitaxial growth, volume 2. Citations from the NTIS data base
[PB80-805583] N80-26189
Gallium arsenide epitaxial growth, volume 3. Citations from the Engineering Index data base
[PB80-805591] N80-26190

EQUATIONS OF MOTION

Equations for determining aircraft motions for accident data
[NASA-TM-78609] N80-25306
Motion of a sphere in the presence of a plane interface. 1. Modeling of non-isothermal turbulent flows. 2 N80-25562

Dynamic responses of a multi-layered rectangular plate on viscoelastic foundation due to moving load's
N80-25686
Suboptimal approximations for control in optimal dynamic programs — trajectory optimization for Earth-Mars or orbit transfer problems
[INPE-1676-TDL/019] N80-25686

EQUATIONS OF STATE
Theoretical equations of state for the rare gases
[LA-8062] N80-25396

EQUATORIAL ATMOSPHERE
Comparison of f0F2 characteristics at nearby equatorial locations in the South American region
[INPE-1737-RPE/136] N80-25970

EQUATORIAL ELECTROJET
Equatorial counterelectrojet: Two distinct categories
[INPE-1683-RPE/114] N80-25975

EQUATORIAL ORBITS
The electrostatic potential of an equatorial satellite
[INPE-1749-RPE/142-REV] N80-25359

EQUILIBRIUM FLOW
Two numerical methods for steady stratified shear flows over an obstacle N80-25568

EQUIPMENT SPECIFICATIONS
Minimum performance standards: Airborne Omega receiving equipment
[RTCA/DO-164A] N80-25310
Materials for helicopter gears
[NASA-CR-163068] N80-25323
Bayesian reliability theory for repairable equipment
[AD-A083009] N80-25684
Solid state crystal physics at very low temperatures
[NASA-CR-163240] N80-26181

EROSION
Gas and steam turbines, general: Corrosion and erosion, Volume 2. Citations from the NTIS data base
[PB80-806664] N80-25342
Gas and steam turbines, general: Corrosion and erosion. Citations from the engineering index data base
[PB80-806672] N80-25343
Fly ash erosion in gas turbine materials N80-25659
Application of remote sensing to state and regional problems — mississippi
[EB0-10153] N80-25735
Geological and geotechnical investigation of sediment redistribution on the central equatorial Pacific seafloor N80-26021

ERROR CORRECTING DEVICES
An alternate algorithm for correction of the scanning multichannel microwave radiometer polarization radiances using Nimbus-7 observed data
[NASA-TM-80672] N80-25762

ERROR DETECTION CODES
Reduction of measured data and a method of early detection of sensor breakdown N80-25283
Inherent error in asynchronous digital flight controls
[AD-A082622] N80-25346
Microprocessor self-diagnosis N80-26042

ESCAPE SYSTEMS
Aircraft survival design guide. Volume 5: Aircraft postcrash survival
[AD-A082513] N80-25308

ESTIMATES
Research on parallel estimators
[CERT-1/7125-DERA] N80-26052

ESTIMATING
Optimal linear estimation applied to generate suboptimal numerical solutions for control problems
[INPE-1731-RPE/131] N80-26084
A comparison of smooth empirical Bayes estimators N80-26102

ETCHANTS
Study of etchants for corrosion-resistant metals, space shuttle external tank
[NASA-CR-161431] N80-25414

ETHYL ALCOHOL
Thermal conductivity measurements and molecular association in ethanol vapor
[CONF-791134-8] N80-25403

EULER EQUATIONS OF MOTION
A two-dimensional unsteady Euler equation solver for flows in arbitrarily shaped regions using a modular concept N80-25293

EUROPE
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747

EUTROPHICATION
Discussion of questions related to hydrophysical and ecological modeling of shallow lakes and reservoirs N80-25721
The prediction of solutions to management and engineering problems related to the eutrophication of bodies of water N80-25723
Development and verification of a model for predicting eutrophication trends in Czechoslovakia N80-25726
The modeling of nutrient exchange between sediment and water N80-25727
Eutrophication modeling efforts for Lake Balaton — Hungary N80-25731

EVACUATING (VACUUM)
Heat conduction in partial vacuum
[ALO-5367-1] N80-25618

EVALUATION
Experiences with a Flying Data Recording System (FRDS) in a German airforce fighter bomber wing after a troop tail N80-25276
Localization of faults in jet engines by calculation of component characteristics N80-25279
Description of the British Civil Aviation airworthiness data recording program N80-25284

EVAPORATION
High rate physical vapor deposition processes N80-25500

EXHAUST EMISSION
Diesel exhaust emissions, volume 2. Citations from the NTIS data base
[PB80-805385] N80-25676
Diesel exhaust emission control for motor vehicles, volume 1. Citations from the Engineering Index data base
[PB80-805393] N80-25677
National Emissions Data System (NEDS), fuel use report
[PB80-148805] N80-25919
Determination of the effects of ambient conditions on CFM56 aircraft engine emissions
[PB80-138587] N80-25944
Guidance for lowest achievable emission rates from 18 major stationary sources of particulate, nitrogen oxides, sulfur dioxide, or volatile organic compounds
[PB80-140262] N80-25948

EXHAUST GASES
Effects of construction and operation of a satellite power system upon the magnetosphere — injection of orbit transfer vehicle exhaust
[ATR-80(7824)-1] N80-25365
Pollutant emissions from flat-flame burners at high pressures
[NASA-TP-1673] N80-25392
Diesel exhaust emissions, volume 2. Citations from the NTIS data base
[PB80-805385] N80-25676
Diesel exhaust emission control for motor vehicles, volume 1. Citations from the Engineering Index data base
[PB80-805393] N80-25677
Diesel exhaust emission control for motor vehicles, volume 2. Citations from the Engineering Index data base
[PB80-805401] N80-25678
Diesel exhaust emissions. Citations from the American Petroleum Institute data base
[PB80-805419] N80-25679
Homogeneous production and removal of NOx from combustion exhaust gases
[ARI-RP-52] N80-25920
Effects of rocket exhaust products in the thermosphere and ionosphere
[LA-8233-MS] N80-25922
Homogeneous production and removal of NOx from combustion exhaust gases — reaction rate over a temperature range
[ARI-RP-49] N80-25925
A study of emissions from passenger cars in six cities, volume A
[PB80-148800] N80-25930
A study of emissions from passenger cars in six cities, volume B
[PB80-148818] N80-25931
Pollutant measurements in plumes from power plants and cities - St. Louis area, July 1976. A project MISTT (midwest sulfur transformation and transport) report
[PB80-139058] N80-25935
Methods for analyzing inorganic compounds in particles emitted from stationary sources
[PB80-141781] N80-25936
Modeling of buoyant plume dispersion in complex terrain
[PB80-145337] N80-25938
Flue gas desulfurization by the modified citrate process: Report of investigations
[PB80-134836] N80-25940
The use of pH and chloride electrodes for the automatic control of flue gas desulfurization systems
[PB80-136464] N80-25947

EXOBIOLOGY
Aerospace medicine and biology. A continuing bibliography, supplement 207
[NASA-SP-7011(207)] N80-26032

EXPERIMENTAL DESIGN
Feasibility studies for light scattering experiments to determine the velocity relaxation of small particles in a fluid
[NASA-CR-163214] N80-25586

EXPLORER 43 SATELLITE
The plasma boundary layer and magnetopause layer of the Earth's magnetosphere N80-25959

EXPLOSIONS
Introduction to detonation phenomena
[LA-UR-79-2880] N80-25625

EXPLOSIVE WELDING
Explosively joining dissimilar metal tubes
[AD-A082068] N80-25663

EXPLOSIVES
Statistical treatment of heterogeneous chemical reaction in shock-initiated explosives
[UCID-18548] N80-25469
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-138472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-138480] N80-26218

EXPONENTIAL FUNCTIONS
An adaptive Bayesian scheme for estimating reliability growth under exponential failure times
[AD-A083006] N80-25683

EXTERNAL TANKS
Study of etchants for corrosion-resistant metals, space shuttle external tank
[NASA-CR-161431] N80-25414

EXTERNALLY BLOWN FLAPS
Measured and predicted impingement noise for a model-scale under the wing external blown flap configuration with a QCSEE type nozzle
[NASA-TM-81494] N80-26115

EXTINGUISHING
Laser spark ignition and extinction of a methane-air diffusion flame
[SAND-79-8288] N80-25399

EXTRAGALACTIC RADIO SOURCES
Milliarcsecond structure of nine compact extragalactic sources at 1671 MHz N80-26233
The origin and relationship of the radio, infrared and visual radiation from compact nonthermal sources N80-26245

EXTRATERRESTRIAL RADIATION
The origin and relationship of the radio, infrared and visual radiation from compact nonthermal sources N80-26249

F

F REGION
Longitudinal and latitudinal abnormalities in the daily variation of f0F2 in the South American region
[INPE-1722-RPE/127] N80-25969

F-4 AIRCRAFT
Runway surface roughness N80-25326

F-16 AIRCRAFT
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915
USAF bioenvironmental noise data handbook. Volume 146: F-16B in-flight crew noise
[AD-A081845] N80-25918

F-18 AIRCRAFT
F/A-18 naval strike fighter: Its effectiveness is uncertain
[PB80-143225] N80-25324
F-104 AIRCRAFT
F-104 low-gravity calibration tests for materials processing in space precursory experiments
[NASA-TM-78278] N80-25365
F-106 AIRCRAFT
USAF bioenvironmental noise data handbook. Volume 144: F-106A in-flight crew noise
[AD-A081846] N80-25916
USAF bioenvironmental noise data handbook. Volume 145: F-106B in-flight crew noise
[AD-A081847] N80-25917
FABRICATION
A review of fabric usage in pavements constructed on low-strength soils
[AD-A083076] N80-25484
Applications of physical vapor deposition processes N80-25539
FAILURE
On problems of estimation for two parameter decreasing failure rate distributions applied to reliability
[AD-A082991] N80-25682
FAILURE ANALYSIS
Localization of faults in jet engines by calculation of component characteristics N80-25279
An Automatic Fault Identification System (AFIS) on board N80-25289
Short beam shear tests of polymeric laminates and unidirectional composites
[NASA-CR-163239] N80-25381
Failure analysis of ceramic-to-metal seals
[BDX-613-2414] N80-25449
Test and evaluate the TRI-GAS low Btu coal gasification process
[FE-2798-74] N80-25476
Bayesian reliability theory for repairable equipment
[AD-A083009] N80-25684
FANS
Engine component improvement: Performance improvement, JT9D-7 3.8 AR fan
[NASA-CR-159806] N80-25332
FAR FIELDS
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915
FARMLANDS
Potential of energy farming for transport fuels in New Zealand
[NZERDC-46] N80-25456
Potential of energy farming for transport fuels in New Zealand, appendices
[NZERDC-46-APP] N80-25457
FATIGUE (MATERIALS)
The Engine Usage Monitoring System (EUMS): An heuristic approach to cost effective flight data monitoring and analysis N80-25280
Materials for helicopter gears
[NASA-CR-163068] N80-25323
Characterization of fatigue damage mechanisms in continuous fiber reinforced metal matrix composites N80-25379
The high-temperature low cycle fatigue behavior of a near-alpha titanium alloy N80-25409
Influence of Alpha/Beta interface phase on fracture toughness and fatigue crack growth rate in Ti-6Al-4V
[AD-A082456] N80-25417
The testing and application of machinability criteria
[CSIR-TRANS-1457] N80-25483
FATIGUE LIFE
Cyclic plastic deformation follower N80-25490
Fatigue of weldments in nuclear pressure vessels and piping
[NUREG-CR-1351] N80-25706
FATIGUE TESTING MACHINES
Fatigue testing machines. Citations from the International Aerospace Abstracts data base
[NASA-CR-162943] N80-25719
FATIGUE TESTS
A study of the reinforcement required for cutouts in aircraft semi-monocoque structure N80-25317
Thermal fatigue evaluation of solder alloys
[BDX-613-2341] N80-25429
La Recherche Aerospatiale, Bimonthly Bulletin no. 1979-5
[ESA-TT-613] N80-25485
Cyclic plastic deformation follower N80-25490
Harmonic excitation of mechanical systems at high frequencies and large accelerators N80-25491
Heating and cooling system — for fatigue test specimens
[NASA-CASE-LAR-12260-1] N80-25693
FEASIBILITY ANALYSIS
Feasibility study of using a coal/water oil emulsion as a clean liquid fuel
[FE-2437-T1-ADD] N80-25483
FEDERAL BUDGETS
Funding for highway safety research, development, and demonstration in the National Highway Traffic Safety Administration
[PB80-137672] N80-26200
FEEDBACK CONTROL
Inherent error in asynchronous digital flight controls
[AD-A082622] N80-25346
FERMI LIQUIDS
Viscosity of He3 in superfluid and Fermi liquid regimes N80-25482
FERROMAGNETIC MATERIALS
Negative shear ferromak for stabilization of current disruptions in toroidal discharge
[IPPJ-451] N80-26158
FERROUS METALS
Hydrogen embrittlement of metals. Citations from the American Petroleum Institute data base
[PB80-805963] N80-25439
Hydrogen embrittlement of metals, volume 3. Citations from the Engineering Index data base
[PB80-805955] N80-25441
FIBER OPTICS
Brightness temperature measurements for high-energy jet propagation
[UCRL-83609] N80-25619
Study of the effects of bending and microbending on glass fibers
[AD-A081239] N80-25702
Study of dynamic effects on glass fibers
[AD-A081238] N80-25703
Infrared fiber optics
[AD-A082450] N80-26141
Microwave fiber optics delay line
[AD-A082505] N80-26142
Fracture analysis of optical fibers
[SAND-79-2431C] N80-26145
FIBER STRENGTH
Characterization of fatigue damage mechanisms in continuous fiber reinforced metal matrix composites N80-25379
Fracture analysis of optical fibers
[SAND-79-2431C] N80-26145
FIELD EFFECT TRANSISTORS
Nanosecond pulsers for MM wave tubes
[AD-A080966] N80-25542
FIELD THEORY (PHYSICS)
Renormalizing the strong-coupling expansion for quantum field theory: Present status
[LA-UR-80-482] N80-26191
Relativity theory. Citations from the NTIS data base
[PB80-805542] N80-26192
FIGHTER AIRCRAFT
The influence of ballistic damage on the aeroelastic characteristics of lifting surfaces — fighter aircraft
[AD-A082536] N80-25322
FILM THICKNESS
Radiative and nonradiative recombination times in semiconducting films
[INPE-1679-RPE/112] N80-26179
FINITE DIFFERENCE THEORY
Hypersonic slip-flow around slender elliptic cones at a slight angle of attack
[DFVLR-FB-79-21] N80-25301
A comparison of finite difference methods for solving Laplace's equation on curvilinear coordinate systems
[NASA-CR-163236] N80-26089
Two sample location and scale tests for distributions with the same finite interval of support N80-26103
FINITE ELEMENT METHOD
An interaction algorithm for prediction of mean and fluctuating velocities in two-dimensional aerodynamic wake flows
[NASA-CR-3301] N80-25298
A new approach in turbomachinery flow analysis using the finite element method N80-25331
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432
Resolution of Navier-Stokes equations by a space-time pseudo-spectral method N80-25487
Finite element analysis of laminar convective heat transfer N80-25574
Finite element simulation of simple three-dimensional fully cavitating flows
[AD-A082823] N80-25816
Finite element analysis of arc welding
[WAPD-TM-1430] N80-25873
Energy dissipation of Rayleigh waves due to absorption along the path of the use of finite-element method N80-25961
Approximation and numerical analysis of nonlinear equations of evolution
[AD-A082452] N80-26092
Finite element analysis of problems with infinitely distant boundaries
[PB80-149230] N80-26100
La Recherche Aerospatiale, Bimonthly Bulletin Number 1979-6
[ESA-TT-632] N80-26255
Variational formulation of the plate equilibrium problem. Application to isoparametric finite elements of plates, part 1 N80-26259
Numerical bracketing of the Eigenvalues of complex linear structures N80-26260
Identification of the elastic characteristics of composite materials by means of vibration tests and a model of discrete conservative calculation N80-26261
FIRES
Remote electromagnetic sensing of underground coal burns
[FE-2414-8] N80-25767
FISSILE FUELS
Summary of the fusion-fission hybrid fuel cycle analysis (tritiumless hybrids)
[UWFDM-337] N80-26138
FISSION PRODUCTS
Summary of the fusion-fission hybrid fuel cycle analysis (tritiumless hybrids)
[UWFDM-337] N80-26138
FISSIONABLE MATERIALS
Comparative method for the evaluation of array reflector materials
[ORNL/CSD-42] N80-25877
FLAME PROPAGATION
Evaluation of existing flammability test methods by comparison of the flammability characteristics of interior materials
[AD-A083137] N80-25393
FLAME SPRAYING
Sprayed coatings N80-25503
FLAMMABILITY
Evaluation of existing flammability test methods by comparison of the flammability characteristics of interior materials
[AD-A083137] N80-25393
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-138472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-138480] N80-26218
FLAPS (CONTROL SURFACES)
Large-scale wind-tunnel tests of inverting flaps on a STOL utility aircraft model
[NASA-TP-1696] N80-25318
FLAT PLATES
Variational formulation of the plate equilibrium problem. Application to isoparametric finite elements of plates, part 1 N80-26259
FLAT SURFACES
Relation between the surface friction of plates and their statistical microgeometry
[AD-A082758] N80-25684
FLEXIBLE BODIES
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163208] N80-25344
FLIGHT CONTROL
Inherent error in asynchronous digital flight controls
[AD-A082622] N80-25346

Technical evaluation report on the 54th(A) Propulsion and Energetics Panel Meeting on Advanced Control Systems for Aircraft Powerplants [AGARD-AR-152] N80-25347
MCC level C formulation requirements. Shuttle TAEM targeting [NASA-TM-80796] N80-25370

FLIGHT CREWS
USAF bioenvironmental noise data handbook. Volume 144: F-106A in-flight crew noise [AD-A081845] N80-25916
USAF bioenvironmental noise data handbook. Volume 145: F-106B in-flight crew noise [AD-A081847] N80-25917
USAF bioenvironmental noise data handbook. Volume 146: F-15B in-flight crew noise [AD-A081848] N80-25918

FLIGHT PATHS
The reconstruction of flight paths from AIDS-data with the aid of modern filtering methods N80-25288

FLIGHT RECORDERS
Aircraft integrated data systems --- conference proceedings, Friedrichshafen, West Germany, 26-27 Sep. 1978 [DFVLR-MITT-79-03] N80-25275
Experiences with a Flying Data Recording System (FRDS) in a German airforce fighter bomber wing after a troop tail N80-25276
Engine parameter trend analysis by LEADS 200: Possibilities and limitations N80-25277
Description of the British Civil Aviation airworthiness data recording program N80-25284
The SYDAS flight data processing system N80-25285
The use of AIDS data at KLM N80-25286
The reconstruction of flight paths from AIDS-data with the aid of modern filtering methods N80-25288
An Automatic Fault Indentification System (AFIS) on board N80-25289
Processing of AIDS flight recorder data for a quick-look with the aid of a hybrid system N80-25290

FLIGHT TESTS
High-speed T-38A landing gear extension loads [NASA-TM-58226] N80-25319
Measurement of the handling characteristics of two light airplanes [NASA-TP-1836] N80-25345
Flight evaluation of a radar cursor technique [AD-A083027] N80-25519
Use of a new analytical technique to determine heat input from inner surface temperatures measured on a hemispherical shell during a free flight experiment [WSRL-0069-TR] N80-25587
Overview of recent aero-optics flight tests N80-25601

FLOOD PREDICTIONS
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) --- Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756

FLOORS
Theoretical and physical approach to light gage steel shear diaphragms N80-25691

FLORIDA
A diffusion climatology for Cape Canaveral, Florida [NASA-TM-58224] N80-25994

FLOW DISTRIBUTION
Overview of 6- X 6-foot wind tunnel aero-optics tests --- transonic wind tunnel tests N80-25590
Flow visualization techniques in the Airborne Laser Laboratory program N80-25608
The application of inverse methods to problems in ocean circulation [PB80-149651] N80-26026

FLOW EQUATIONS
A two-dimensional unsteady Euler equation solver for flows in arbitrarily shaped regions using a modular concept N80-25293
Transonic small perturbation equation applied to the solution of two-dimensional unsteady flows N80-25489

FLOW MEASUREMENT
Airborne measurement of atmospheric turbulence N80-25606

FLOW RESISTANCE
Relation between the surface friction of plates and their statistical microgeometry [AD-A082758] N80-25664

FLOW VELOCITY
An interaction algorithm for prediction of mean and fluctuating velocities in two-dimensional aerodynamic wake flows [NASA-CR-3301] N80-25298
Analytical and experimental investigation of flow between a smooth stationary disc and a grooved rotating disc N80-25584
Unsteady density and velocity measurements in the 6 foot x 6 foot wind tunnel N80-25594

FLOW VISUALIZATION
Aero-optical characterization of aircraft optical turrets by holography, interferometry and shadowgraph N80-25593

FLOWMETERS
Investigation leading to the development of an acoustic Doppler slurry flowmeter [ANL-FE-49622] N80-25640

FLUES
Evaluation of physical/chemical coal cleaning and flue gas desulfurization [PB80-147622] N80-25481

FLUID DYNAMICS
Fluid processes in supersonic diffusion lasers N80-25646

FLUID FLOW
Relation between the surface friction of plates and their statistical microgeometry [AD-A082758] N80-25664

FLUID MECHANICS
The measurement of turbulence with the burst-type laser Doppler anemometer: Errors and correction methods N80-25569
European Scientific notes, volume 34, no. 1 [AD-A081929] N80-26263

FLUIDICS
Fluid control devices, volume 2. Citations from the NTIS data base [PB80-805260] N80-25632
Fluid control devices. Citations from the Engineering Index data base [PB80-805278] N80-25633

FLUORESCENCE
Radiative and nonradiative recombination times in semiconducting films [INPE-1679-RPE/112] N80-26179

FLUTTER
Experimental determination of unsteady blade element aerodynamics in cascades. Volume 1: Torsion mode cascade [NASA-CR-159831] N80-25335

FLUTTER ANALYSIS
Experimental and analytical transonic flutter characteristics of a geared-elevator configuration [NASA-TP-1666] N80-25321

FLYWHEELS
Preliminary development of the Band Type Variable Inertia Flywheel (BVIF) [SAND-79-7089] N80-25879
Energy-storage systems for automobile propulsion, 1979 study. Volume 3: Battery/flywheel electric vehicles using advanced batteries [UCRL-52841-VOL-3] N80-26213

FORBIDDEN TRANSITIONS
Studies in relativistic many-body perturbation theory for atomic systems: Hyperfine properties and forbidden optical transitions N80-26118

FOREIGN POLICY
World Energy Data System (WENDS). Volume 5: International organization data [ANL/PMS-79-2-VOL-5] N80-25831

FORESTS
Application of remote sensing to state and regional problems --- mississippi [E80-10153] N80-25735
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest --- Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750

FORGING
Forging evaluation of 304L stainless steel [RFP-2897] N80-25420

FOSSIL FUELS
Combustion research [LBL-9809] N80-25400
Consequences of the mass spectrometric and infrared analysis of oils and asphaltenes for the chemistry of coal liquefaction. Characterization of coal-derived liquids and other fossil fuel related materials employing mass spectrometry [FE-2537-10] N80-25480
Methods for analyzing inorganic compounds in particles emitted from stationary sources [PB80-141781] N80-25836

FOURIER TRANSFORMATION
Fourier transform infrared investigation of the structure and moisture stability of the epoxy matrix in glass-reinforced composites N80-25378

FRACTOGRAPHY
Evaluation of the stress corrosion cracking resistance of several high strength low alloy steels [NASA-TM-78276] N80-25413

FRACTURE MECHANICS
Linear-elastic and elastic-plastic fracture mechanics of structural materials [DFVLR-FB-79-31] N80-25717
Fracture analysis of optical fibers [SAND-79-2431C] N80-26145

FRACTURE STRENGTH
Section size effects on toughness of various cast steels N80-25410
Influence of Alpha/Beta interface phase on fracture toughness and fatigue crack growth rate in Ti-6Al-4V [AD-A082456] N80-25417
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement [FE-3060-T2] N80-25421
The effect of crack length and side grooves on the ductile fracture toughness properties of ASTM A533 steel [NUREG-CR-1171] N80-25709

FREQUENCY ASSIGNMENT
VHF air-ground technology and spectrum utilization [RTCA-155-79/SC140-17-REV] N80-25513

FREQUENCY DIVISION MULTIPLE ACCESS
Study of advanced communications satellite systems based on SS-FDMA [NASA-CR-159778] N80-25357

FREQUENCY MODULATION
CARFAX: An example of an FM signal generated using digital techniques [BBC-RD-1980/2] N80-25512

FREQUENCY STABILITY
Research of an optimal configuration for high stability quartz oscillators on board aircraft and missiles N80-26258

FREQUENCY SYNTHESIZERS
Surface acoustic wave microwave oscillator and frequency synthesizer [AD-A082351] N80-25544

FRESNEL DIFFRACTION
Optimization of noise barriers [DFVLR-FB-79-29] N80-26116

FRESNEL INTEGRALS
Eigenvalues for unstable resonators with slightly misaligned strip mirrors [INPE-1738-RPE/137-REV] N80-26140

FRETTING
Applications of sprayed coatings N80-25507

FRICTION
Frictional damping at unlubricated metallic interfaces N80-25657

FUEL CELLS
High-temperature fuel cell research and development [SAN-1485-T1] N80-25846
Fuel cell research on second-generation molten-carbonate systems [SAN-11276-1] N80-25847
High temperature fuel cell research and development [SAN-1485-2] N80-25848
New electrolytes for direct methane fuel cells [DOE/ET-11321/T1] N80-25891
Evaluation of air cathodes for potential use in development of aluminum-air cells [UCID-18561] N80-25893
Advanced fuel cell development [ANL-79-51] N80-25895
Development of fuel cell technology for vehicular applications [BNL-51047] N80-26216

FUEL COMBUSTION
Homogeneous production and removal of NOx from combustion exhaust gases
[ARI-RP-52] N80-25920

FUEL CONSUMPTION
Improving the performance and fuel consumption of dual chamber stratified charge spark ignition engines
[COO-4483-5] N80-25869
National Emissions Data System (NEDS), fuel use report
[PB80-148805] N80-25910
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies
[NASA-CR-163228] N80-26204
Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210

FUEL INJECTION
Analytical and experimental evaluations of the effect of broad property fuels on combustors for commercial aircraft gas turbine engines
[NASA-TM-81496] N80-25454

FUEL PRODUCTION
Potential of energy farming for transport fuels in New Zealand
[NZERDC-46] N80-25456
Potential of energy farming for transport fuels in New Zealand, appendices
[NZERDC-46-APP] N80-25457
EDS coal liquefaction process development, phase 4
[FE-2883-33] N80-25474

FUEL SYSTEMS
Analytical and experimental evaluations of the effect of broad property fuels on combustors for commercial aircraft gas turbine engines
[NASA-TM-81496] N80-25454

FUEL TANK PRESSURIZATION
External fuel vaporization study, phase 1
[NASA-CR-159650] N80-25453

FUELS
Analytical and experimental evaluations of the effect of broad property fuels on combustors for commercial aircraft gas turbine engines
[NASA-TM-81496] N80-25454
Environmental control technology for biomass flash pyrolysis
[CONF-800129-2] N80-25477

FUNCTIONAL ANALYSIS
Application of functional analysis to perturbation theory of differential equations — nonlinear perturbation of the harmonic oscillator
[NASA-TM-81073] N80-26067

FURNACES
Evaluation of stationary source particulate measurement methods. Volume 4: Basic oxygen furnaces
[PB80-141633] N80-25837

FUSELAGES
Transonic flow field analysis for wing-fuselage configurations
[NASA-CR-3243] N80-25295

FUSION REACTORS
Alloy development for irradiation performance in fusion reactors
[COO-5098] N80-25426
Important atomic collision processes in the heavy ion inertial fusion program
[SAN-0115-137-1] N80-26129
Magnetic confinement in plasmas in nuclear devices
[UCRL-82765] N80-26165

FUSION-FISSION HYBRID REACTORS
Summary of the fusion-fission hybrid fuel cycle analysis (tritiumless hybrids)
[UWFDM-337] N80-26138

G

GALACTIC CLUSTERS
Surface photometry of the Coma Cluster of galaxies N80-26223

GALACTIC NUCLEI
X-rays from active galactic nuclei: Emission mechanisms and interaction with ambient media N80-26247

GALAXIES
The dwarf spheroidal galaxy in Draco N80-26221
On the physical environment in galactic nuclei N80-26234
The evolution of supernova remnants in different galactic environments, and its effects on supernova statistics
[NASA-TM-80707] N80-26236

GALILEO PROBE
Laminar and turbulent flow solutions with radiation and ablation injection for Jovian entry — radiative heating rates for the Galileo probe
[NASA-CR-163215] N80-26228

GALILEO PROJECT
Selenide isotope Generator for the Galileo mission. Heat pipe attachment technology
[TES-33009-45] N80-25832
Selenide isotope generator for the Galileo mission. GIG/Galileo hermetic receptacle test program
[TES-33009-47] N80-25833
Selenide isotope generator for the Galileo mission. SIG thermal insulation tests evaluation
[TES-33009-50] N80-25834
Selenide isotope generator for the Galileo mission. SIG hermetic bimetal weld transition joint
[TES-33009-51] N80-25835

GALILEO SPACECRAFT
An application of software design and documentation language — Galileo spacecraft command and data subsystem
[NASA-CR-163258] N80-26057

GALLIUM ARSENIDES
Preliminary materials assessment for the Satellite Power System (SPS)
[DOE/ER-0038] N80-25364
Gallium arsenide epitaxial growth, volume 2. Citations from the NTIS data base
[PB80-805583] N80-26189
Gallium arsenide epitaxial growth, volume 3. Citations from the Engineering Index data base
[PB80-805591] N80-26190

GAMMA FUNCTION
Some convexity properties of Euler's gamma function
[MC-ZW-105/78] N80-26099

GAMMA RAY ASTRONOMY
The Goddard program of gamma ray transient astronomy
[NASA-TM-80675] N80-26230

GAMMA RAY SPECTRA
High resolution spectroscopy of two gamma-ray bursts in November 1978
[NASA-TM-80575] N80-26252

GAMMA RAY SPECTROMETERS
Determination of primordial and cosmogenic radioactivity in achondritic meteorites by low-level, gamma-ray spectrometry
[DOE/TIC-11096] N80-26241

GAMMA RAYS
Journal of research of the National Bureau of Standards, volume 85, no. 1 — aqueous electrolytes, iridium-192 gamma ray sources, air density at differing altitude, and isotopic abundance of thallium
[PB80-146566] N80-25377
Nuclear gamma ray lines from supernovae
[INPE-1665-RPE/105] N80-26254

GAS BEARINGS
Gas bearings. Citations from the Engineering Index data base
[PB80-802507] N80-25680

GAS CHROMATOGRAPHY
Methods of evaluation of potentially hazardous organics in water
[PB80-135122] N80-25406

GAS COMPOSITION
Review of Spectroscopic Data for Measurements of Stratospheric Species
[NASA-CP-2136] N80-26125

GAS DISCHARGES
A disc LaB6 cathode for plasma production in magnetic field
[IPPJ-449] N80-26155

GAS DYNAMICS
Particle-initiated breakdown in gas dielectric cable insulation expanded scope program
[EPRI-EL-1264] N80-25553
An approximation and an associated numerical method for two-dimensional steady supersonic gas dynamics N80-25567
Experimental investigation of gas flow dynamics of an inductively coupled argon plasma N80-26146

GAS EXPANSION
Effects of various assumptions on the calculated liquid fraction in isentropic saturated equilibrium expansions
[NASA-TP-1682] N80-25615

GAS FLOW
Gas-particle flow in the entry region of a curved pipe
[LBL-9905] N80-25827

GAS GENERATORS
Evaluation of the Texaco synthesis gas generation process for the production of hydrogen from SRC-2 residue
[ORNL/SUB-7240/6] N80-25484

GAS JETS
Brightness temperature measurements for high-energy jet propagation
[UCRL-83609] N80-25619

GAS TUNGSTEN ARC WELDING
Finite element analysis of arc welding
[WAPD-TM-1430] N80-25673

GAS TURBINE ENGINES
Classification of operating conditions of turbomachines from solid borne sound N80-25282
External fuel vaporization study, phase 1
[NASA-CR-159650] N80-25453
Analytical and experimental evaluations of the effect of broad property fuels on combustors for commercial aircraft gas turbine engines
[NASA-TM-81496] N80-25454
Gas turbine engines and transmissions for bus demonstration programs
[COO-4867-05] N80-26215

GAS TURBINES
Gas and steam turbines, general: Corrosion and erosion, Volume 2. Citations from the NTIS data base
[PB80-806664] N80-25342
Gas and steam turbines, general: Corrosion and erosion. Citations from the engineering index data base
[PB80-806672] N80-25343
Overlay coatings for gas turbine airfoils N80-25506
Compact closed cycle Brayton system feasibility study, volume 1 — marine propulsion
[AD-A081379] N80-25686
An open cycle turbine solar thermal power system N80-26257

GAS-METAL INTERACTIONS
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[FE-3050-T2] N80-25421
Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-64] N80-25428
High temperature corrosion Studies. A. Iron: Based superalloy in SO2/O2 atmospheres. B. Gas: Solid reaction with formation of volatile species
[IS-T-993] N80-25430

GAS-SOLID INTERFACES
Resonance Raman spectroscopy of adsorbed species at solid-gas interfaces N80-25388
New mathematical technique for determining the parameters of gas permeation through solids
[GEPP-OP-474] N80-25821

GASEOUS FUELS
Homogeneous production and removal of NOx from combustion exhaust gases
[ARI-RP-52] N80-25920

GASES
Conversion of biomass materials into gaseous products. Operation of the POU
[SAN-1241-3] N80-25486

GASIFICATION
Problems and opportunities for solar energy in biomass, pyrolysis, and gasification
[SERI/TP-332-495] N80-25810

GASOLINE
Research and development of an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels
[FE-1800-42] N80-25473
Biosources digest, a journal on biomass utilization, volume 1, no. 1
[PB80-140973] N80-25908

Biosources digest: A journal on biomass utilization, volume 1, no. 4
[PB80-140981] N80-25809

GAUGE INVARIANCE
Monte Carlo simulations of lattice gauge theories
[BNL-27323] N80-26185

GEARS
Materials for helicopter gears
[NASA-CR-163088] N80-25323

GENERAL AVIATION AIRCRAFT
Measurement of the handling characteristics of two light airplanes
[NASA-TP-1636] N80-25345

GENETICS
Innate and genetic nature of circadian rhythms
[DOE/TIC-11132] N80-25038

GEODESY
Use of auxiliary ellipsoids in height-controlled spatial adjustments
[PB80-155104] N80-25776
Mathematical methods in physics: Tensor analysis 3 — geodesy, Einstein's gravitational law, and the relativistic form of Maxwell equations
[INPE-1648-RPE/102-REV] N80-26088

GEODYNAMICS
NASA geodynamics program
[NASA-TM-81978] N80-25966

GEOLOGICAL SURVEYS
Microcrack technology — core samples of granite in New Hampshire
[DOE/ER-04972/2] N80-25713
Geologic application of thermal-inertia mapping from satellite — Powder River Basin, Wyoming and Cabeza Prieta Arizona
[E80-10151] N80-25733
U.S. geological survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft, Sequoia, Kings, Canyon National Park, California. Project no. 8: Conservation of natural areas and of the genetic material they contain
[PB80-147291] N80-25775
Environmental assessment: Geothermal energy geopressure subprogram. DOE Sweet Lake no. 1, Cameron Parish, Louisiana
[DOE/EA-0065] N80-25829
Seismic engineering program
[PB80-149909] N80-25884

GEOMAGNETISM
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
N80-25311
Initial geomagnetic field model from MAGSAT
[NASA-TM-80679] N80-25967
Magnetopause reconnection
[INPE-1667-RPE/106] N80-25973
Maximum entropy spectral analysis of geomagnetic disturbing indices
[INPE-1693-RPE/120-REV] N80-26253

GEOMETRY
Relation between the surface friction of plates and their statistical microgeometry
[AD-A082758] N80-25664

GEOPHYSICS
Solar-geophysical data number 423, part 1. Prompt Reports: Data for October 1979, September 1979
[PB80-146160-SGD-423-PT-1] N80-26244
Solar-geophysical data numer 423, part 2. Comprehensive Reports. Data for May 1979, March 1979 and miscellanea
[PB80-146178] N80-26245

GEORGIA
Solar total energy project Shenandoah
[ALO-3985-1-REV-1] N80-25825

GEOS 3 SATELLITE
GEOS-3 radar altimeter study for the South Atlantic Bight
[NASA-TM-73286] N80-26023

GEOSTROPHIC WIND
The climatic impact of sea surface temperature anomalies on zonally symmetric and asymmetric flows: A quasi-geostrophic modeling approach N80-26022

GEOTHERMAL ENERGY CONVERSION
Hydrogen sulphide stress corrosion cracking in materials for geothermal power
[COO-2602-7] N80-25707
Long-term supply curves for geothermal energy: The impacts of technology
[PNL-3072] N80-25865

GEOTHERMAL ENERGY UTILIZATION
Magma energy: A feasible alternative?
[SAND-80-0309C] N80-25859
Multi-use geothermal energy system with augmentation for enhanced utilization. A non-electric application of geothermal energy in Susanville, California
[SAN-1740-2] N80-25868

GEOTHERMAL RESOURCES
Performance evaluation of Magma Power company's reinjection well no. 46-7 at the East Mesa KGRA, California
[SAND-79-7127] N80-25863
Environmental assessment: Geothermal energy geopressure subprogram. DOE Sweet Lake no. 1, Cameron Parish, Louisiana
[DOE/EA-0065] N80-25829

GEOTHERMAL TECHNOLOGY
Design and application of a mega-moment electromagnetic dipole source — to geothermal exploration surveys
[LBL-8920] N80-25549

GLASS
Fourier transform infrared investigation of the structure and moisture stability of the epoxy matrix in glass-reinforced composites N80-25378
Crystallization of ultra-quenched polymer glasses N80-25446
Use of thin glass reflectors for solar concentrators
[SAND-80-0109C] N80-25857
Solarization of heliostat glasses
[SAND-79-8754] N80-25858

GLASS FIBER REINFORCED PLASTICS
Reinforced plastics: Fiberglass reinforcement, volume 2: Citations from the NTIS data base — with polymer matrices
[PB80-804743] N80-25451

GLASS FIBERS
Study of the effects of bending and microbending on glass fibers
[AD-A081239] N80-25702
Study of dynamic effects on glass fibers
[AD-A081238] N80-25703

GLOBAL AIR POLLUTION
Atmospheric distributions, sources and sinks of selected halocarbons, hydrocarbons, SF6, and N2O
[PB80-142706] N80-25834

GOES SATELLITES
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758

GRAIN BOUNDARIES
Plastic creep flow effects in the diffusive cavitation of grain boundaries
[COO-3084-74] N80-25711

GRAPHITE
Incremental stress-strain law for graphite under multiaxial loadings
[GA-A-15573] N80-25704
Oxygen reduction on a graphite paste and a catalyst loaded graphite paste electrode
[IS-T-886] N80-25898

GRAPHITE-EPOXY COMPOSITE MATERIALS
Flight service evaluation of an advanced composite empennage component on commercial transport aircraft
[NASA-CR-159286] N80-25320

GRAPHS (CHARTS)
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejos and South Fork River basins N80-25752

GRASSLANDS
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10163] N80-25738

GRAVELS
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735

GRAVITATION
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
[AD-A082494] N80-25313

GRAVITATION THEORY
Relativity theory. Citations from the NTIS data base
[PB80-805542] N80-26192

GRAVITATIONAL FIELDS
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
N80-25311

GREAT LAKES (NORTH AMERICA)
Mariners weather log, volume 23, no. 6
[PB80-145113] N80-26011

GREAT SMOKY MOUNTAINS (NC-TN)
Biogenic hydrocarbon contribution to the ambient air of selected areas - Tulsa; Great Smokey Mountains; Rio Blanco County, Colorado
[PB80-139086] N80-25945

GREENLAND
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25783

GROUND CREWS
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915

GROUND STATE
Moller-Plesset electron correlation studies of atoms and small molecules N80-26120

GROUND STATIONS
Communication satellite technology: State of the art and development opportunities
[NASA-CR-159977] N80-25358

GROUND SUPPORT EQUIPMENT
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 1
[AD-A081233] N80-25314
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 2: Appendices
[AD-A081133] N80-25315

GROUND TRUTH
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746

GROUND WATER
Determination of selected hydraulic properties of subarctic soils
[PB80-150956] N80-25983

GROUP THEORY
Monte Carlo simulations of lattice gauge theories
[BNL-27323] N80-26185

GULF OF MEXICO
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735
Ocean thermal energy conversion ecological data report from OSS researcher in Gulf of Mexico, 12-23 July 1977
[LBL-8945] N80-25921

GULF STREAM
GEOS-3 radar altimeter study for the South Atlantic Bight
[NASA-TM-73286] N80-26023

GUNS
Prospects for generating 1-10 TPa pressures with a railgun
[UCRL-82296-REV-2] N80-25641

GUSTS
Vector wind profile gust model
[NASA-CR-161474] N80-25992
Vector wind profile gust model
[NASA-CR-161475] N80-25993

GYROFREQUENCY
Observations of electron gyroharmonic waves and the structure of the Io torus — Jupiter 1 spacecraft radio astronomy experiment
[NASA-TM-80696] N80-26231

H

HAIL
Simulated hail test facility
[SAND-79-1114] N80-25349

HALOCARBONS
Atmospheric distributions, sources and sinks of selected halocarbons, hydrocarbons, SF6, and N2O
[PB80-142706] N80-25834

HARDENING (MATERIALS)
Laser surface alloying N80-25504
Wear resistant coatings made by chemical vapour deposition N80-25508

Residual stress factors in torsional failure modes of induction-hardened steel axle shafts N80-25589

HARDWARE

Exploratory studies of the cruise performance of upper surface blown configurations. Experimental program: Test facilities, model design instrumentation, and low-speed, high-lift tests [NASA-CR-3192] N80-25297

HARMONIC ANALYSIS

Initial geomagnetic field model from MAGSAT [NASA-TM-80679] N80-25867

HARMONIC EXCITATION

Harmonic excitation of mechanical systems at high frequencies and large accelerators N80-25491

HARMONIC OSCILLATORS

Application of functional analysis to perturbation theory of differential equations — nonlinear perturbation of the harmonic oscillator [NASA-TM-81073] N80-26087

HARRIER AIRCRAFT

A decision by the Secretary of Defense is needed on the AV-8B aircraft program [PB80-143259] N80-25291

HAZARDS

Methods of evaluation of potentially hazardous organics in water [PB80-125122] N80-25406

HEAT CAPACITY MAPPING MISSION

Geologic application of thermal-inertia mapping from satellite — Powder River Basin, Wyoming and Cabeza Prieta Arizona [E80-10151] N80-25733

HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California [E80-10163] N80-25738

Topoclimatological and snow-hydrological survey of Switzerland [E80-10164] N80-25739

Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee [E80-10165] N80-25740

HCMM: Soil moisture experiment — South Alberta, Canada [E80-10166] N80-25741

HEAT EXCHANGERS

Boiling heat transfer and critical heat flux in helical coils N80-25576

Long tube heat exchanger: The facility and some preliminary tests on the down center/up annular flow configuration [SAND-79-0823] N80-25623

HEAT FLUX

Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee [E80-10165] N80-25740

HEAT PIPES

Selenide Isotope Generator for the Galileo mission. Heat pipe attachment technology [TES-33009-45] N80-25832

HEAT PUMPS

Magnetic refrigeration for space applications: Report on a design study [LA-8134] N80-25492

Performance evaluation of a selected three-ton air-to-air heat pump in the heating mode [ORNL/CON-34] N80-25630

Heat-pump-centered integrated community energy systems: Systems development, Consolidated Natural Gas Service Company [ANL/CNSV/TM-29] N80-25890

Optimization of solar assisted heat pump systems via a simple analytic approach [BNL-27316] N80-25896

Solar-assisted heat pump-swimming pool synergetics for domestic heating [UCRL-83458] N80-25905

Energy test method development for electric heat pump water heaters [PB80-145212] N80-25911

HEAT RADIATORS

Design and development of a hard tube flexible radiator system [NASA-CR-160663] N80-25380

HEAT RESISTANT ALLOYS

High temperature corrosion Studies. A. Iron: Based superalloy in SO2/O2 atmospheres. B. Gas: Solid reaction with formation of volatile species [IS-T-893] N80-25430

Superalloys, Volume 2. Citations from the NTIS data base [PB80-805831] N80-25436

superalloys, volume 3. Citations from the Engineering Index data base [PB80-805849] N80-25437

Superalloys, volume 4. Citations from the Engineering Index data base [PB80-805856] N80-25438

HEAT SHIELDING

Evaluation of hot corrosion behavior of thermal barrier coatings [NASA-TM-81520] N80-25412

HEAT SOURCES

High temperature hydrogen cycles for solar heat sources [LA-UR-80-194] N80-25817

HEAT STORAGE

Thermal energy storage [NASA-TM-81514] N80-25779

Hybrid thermal storage with water [ESG-DOE-13259] N80-25861

Two-tank seasonal storage concept for solar space heating of buildings [CONF-791226-2] N80-25867

Analysis of community solar systems for combined space and domestic hot water heating using annual cycle thermal energy storage [SERI/TP-355-570] N80-25900

HEAT TRANSFER

Numerical computations of friction and heat transfer in free swirling pipe flow N80-25570

Heat transfer to staggered arrays of impinging circular air jets N80-25571

A photographic study of drop formation heat and mass transfer N80-25581

Analytical and experimental investigation of flow between a smooth stationary disc and a grooved rotating disc N80-25584

Use of a new analytical technique to determine heat input from inner surface temperatures measured on a hemispherical shell during a free flight experiment [WSRL-0089-TR] N80-25587

Heating a fluid in full flow inside a horizontal cylindrical pipe using solar energy [INPE-1680-TDL/020] N80-25796

Superior heat transfer fluids for solar heating and cooling applications [ALO-35356-1] N80-25815

On the efficiency of meridional eddy transport processes during the major stratospheric warming of January 1977 [INPE-1687-RPE/118] N80-25968

Some observed and theoretical aspects of the sudden stratospheric heating in the Northern and Southern Hemispheres [INPE-1671-TDL/016] N80-25976

HEAT TRANSFER COEFFICIENTS

Determination of friction factors and heat transfer coefficients for flow past artificially roughened surfaces [DOE/TIC-10283] N80-25629

HEAT TREATMENT

Critical studies of the rapid pyrolysis and hydropyrolysis of coal [FE-MIT-2295T26-9] N80-25459

HEATING

Heating and cooling system — for fatigue test specimens [NASA-CASE-LAR-12393-1] N80-25680

HEATING EQUIPMENT

Solair heater program: Solair applications study [COO-2705-3] N80-25813

Comparative performance of two types of evacuated tubular solar collectors in a residential heating and cooling system [COO-2577-19] N80-25864

Site and building energy-conservation study: Survey of building 251, diagnostic chemistry [UCRL-15190] N80-25880

Energy test method development for electric heat pump water heaters [PB80-145212] N80-25911

HEAVY IONS

Important atomic collision processes in the heavy ion inertial fusion program [SAN-0115-137-1] N80-26129

HEAVY NUCLEI

The isotopic composition of cosmic rays N80-26250

HELICAL FLOW

Boiling heat transfer and critical heat flux in helical coils N80-25576

HELICOPTER PROPELLER DRIVE

Materials for helicopter gears [NASA-CR-163088] N80-25323

HELICOPTER WAKES

Development and validation of a combined rotor fuselage induced flow field computational method — Langley V/STOL tunnel [NASA-TP-1656] N80-25296

HELICOPTERS

Materials for helicopter gears [NASA-CR-163088] N80-25323

Sensor for measuring instantaneous angle of attack of helicopter blades [NASA-CR-3297] N80-25330

Evaluation of new materials for rotor hub journal bearings — self lubricating materials [AD-A082444] N80-25885

HELIOSTATS

Solarization of heliostat glasses [SAND-79-8754] N80-25858

HELIUM

Low-temperature helium embrittlement of tritium-charged stainless steel [DP-MS-79-64] N80-25429

HERMETIC SEALS

Hermetic seal for a shaft [NASA-CASE-NPO-15115-1] N80-25660

HETEROGENEITY

Statistical treatment of heterogeneous chemical reaction in shock-initiated explosives [UCID-18548] N80-25489

HIGH ALTITUDE

Liquid water measurements in high elevation continental cumuli [PB80-143928] N80-26017

HIGH CURRENT

A quick start of high current discharge from a cold LaB6 cathode for neutral beam injection [IPPJ-453] N80-26159

HIGH ENERGY INTERACTIONS

Inelastic strong interactions at high energies [COO-2978-5] N80-26134

HIGH FREQUENCIES

NBS time and frequency dissemination services [PB80-147747] N80-25494

High frequency analog LSI development [AD-A082664] N80-25543

HIGH PRESSURE

Pollutant emissions from flat-flame burners at high pressures [NASA-TP-1673] N80-25392

HIGH RESOLUTION

The Goddard program of gamma ray transient astronomy [NASA-TM-80675] N80-26230

High resolution spectroscopy of two gamma-ray bursts in November 1978 [NASA-TM-80575] N80-26252

HIGH SPEED

The dynamic analysis of high-speed flexible cam mechanisms N80-25658

HIGH STRENGTH STEELS

Advances in materials science [UCRL-50058-79-3] N80-25378

Evaluation of the stress corrosion cracking resistance of several high strength low alloy steels [NASA-TM-78276] N80-25413

HIGH TEMPERATURE

The high-temperature low cycle fatigue behavior of a near-alpha titanium alloy N80-25409

Plasma aided techniques N80-25501

Performance of digital integrated circuit technologies at very high temperature [SAND-79-2092C] N80-25550

High temperature fuel cell research and development [SAN-1485-2] N80-25848

HIGH TEMPERATURE PLASMAS
Relativistic nonlinear cyclotron waves in a hot electron-ion plasma
[INPE-1723-RPE/128-REV] N80-26152
HIGH TEMPERATURE RESEARCH
High-temperature fuel cell research and development
[SAN-1495-T1] N80-25848
HIGH TEMPERATURE TESTS
Heating and cooling system — for fatigue test specimens
[NASA-CASE-LAR-12393-1] N80-25695
Fatigue testing machines. Citations from the International Aerospace Abstracts data base
[NASA-CR-162943] N80-25719
HIGH VOLTAGES
The planar multijunction cell: A new solar cell for Earth and space
[NASA-TM-81526] N80-26182
HIGHWAYS
Permanent deformation of cohesionless subgrade material under cyclic loading N80-25692
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735
Application of computer and interactive graphics — highway and railroad traffic flow
[PB80-147051] N80-26079
Funding for highway safety research, development, and demonstration in the National Highway Traffic Safety Administration
[PB80-137672] N80-26200
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-138472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-138480] N80-26218
HOLOGRAPHIC INTERFEROMETRY
Aero-optical characterization of aircraft optical turrets by holography, interferometry and shadowgraph N80-25693
The application of holography to stress analysis
[LPC-84] N80-25715
HOLOGRAPHY
Correlation holography: Imaging of atoms when sigma sub (inelastic) sigma sub (elastic)
[DOE/ER-70004/258] N80-25644
The application of holography to stress analysis
[LPC-84] N80-25715
HORIZONTAL TAIL SURFACES
Experimental and analytical transonic flutter characteristics of a geared-elevator configuration
[NASA-TP-1668] N80-25321
HOT CORROSION
Gas and steam turbines, general: Corrosion and erosion, Volume 2. Citations from the NTIS data base
[PB80-806664] N80-25342
Gas and steam turbines, general: Corrosion and erosion. Citations from the engineering index data base
[PB80-806672] N80-25343
Evaluation of hot corrosion behavior of thermal barrier coatings
[NASA-TM-81520] N80-25412
High temperature corrosion Studies. A. Iron: Based superalloy in SO2/O2 atmospheres. B. Gas: Solid reaction with formation of volatile species
[IS-T-893] N80-25430
Electrode polarization studies in hot corrosion systems
[COO-2960-4] N80-25433
HOT STARS
Atmospheres for hot, high-gravity, pure helium stars N80-26224
HOT-FILM ANEMOMETERS
Relation between the surface friction of plates and their statistical microgeometry
[AD-A082758] N80-25664
HUBS
Evaluation of new materials for rotor hub journal bearings — self lubricating materials
[AD-A082444] N80-25865
HUGONIOT EQUATION OF STATE
Summary and review of hydrogen theoretical equation-of-state models at Lawrence Livermore Laboratory
[UCID-18489] N80-25404
HUMAN FACTORS ENGINEERING
Visual problems and night landing guidance of the CH-47 (Chinook) helicopter
[ARL/SYS-TM-50] N80-25312
Development of an automated stress/duress detection system, phase 1 and phase 2
[SAND-79-7038] N80-26036
Head-up transition behavior of pilots during simulated low-visibility approaches
[NASA-TP-1618] N80-26039
Flight-deck automation: Promises and problems
[NASA-TM-81206] N80-26040
HUMAN PERFORMANCE
The relationship of exercise performance to variations in blood acid-base status induced by changes in the inspired oxygen fraction N80-26030
Computerized adaptive performance evaluation
[AD-A082945] N80-26085
HUMAN REACTIONS
Space Colonies. Citations from the International Aerospace Abstracts data base
[NASA-CR-163204] N80-25353
HUMAN TOLERANCES
Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307
HUNGARY
Eutrophication modeling efforts for Lake Balaton — Hungary N80-25731
HURRICANES
Hurricanes forecasting, modification, and research. Citations from the NTIS data base
[PB80-804255] N80-26020
HYBRID CIRCUITS
Hybrid microelectronic circuits, volume 2. Citations from the NTIS data base
[PB80-805822] N80-25562
HYBRID COMPUTERS
Processing of AIDS flight recorder data for a quick-look with the aid of a hybrid system N80-25290
HYBRID PROPULSION
Advanced propulsion system for hybrid vehicles
[NASA-CR-159771] N80-26212
HYDRAULIC JETS
Drilling horizontal holes in coal bed from the surface with water jets
[SAND-80-0057C] N80-25796
HYDRAZINE ENGINES
Performance prediction of power augmented electrothermal hydrazine thrusters
[TUM-LRT-KB-78/1] N80-25375
HYDROCARBON COMBUSTION
Fly ash erosion in gas turbine materials N80-25659
HYDROCARBON FUELS
Liquid fuels production from biomass, no. 7
[COO-4388-7] N80-25462
HYDROCARBONS
Catalytic conversion of methanol to low molecular weight hydrocarbons
[COO-4717-T1] N80-25470
Atmospheric distributions, sources and sinks of selected halocarbons, hydrocarbons, SF6, and N2O
[PB80-142706] N80-25934
Biogenic hydrocarbon contribution to the ambient air of selected areas - Tulsa; Great Smokey Mountains; Rio Blanco County, Colorado
[PB80-139066] N80-25945
HYDRODYNAMIC EQUATIONS
Two examples of the use of hydrodynamic models in ecological studies — Lake Huron and Lake Erie water circulation N80-25724
HYDROELECTRIC POWER STATIONS
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
HYDROGEN
Reaction rate self-oscillations during the oxidation of hydrogen over nickel N80-25390
Summary and review of hydrogen theoretical equation-of-state models at Lawrence Livermore Laboratory
[UCID-18489] N80-25404
Anelastic studies of interstitially trapped hydrogen in niobium
[DOE/ER-01198/1299] N80-25427
Evaluation of the Texaco synthesis gas generation process for the production of hydrogen from SRC-2 residue
[ORNL/SUB-7240/6] N80-25464
High temperature hydrogen cycles for solar heat sources
[LA-UR-80-184] N80-25817
HYDROGEN ATOMS
Nuclear magnetic resonance wide-line study of hydrogen in the yttrium-yttrium dihydride system
[IS-T-877] N80-26136
HYDROGEN EMBRITTLEMENT
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[RR-79-9D9-HYTEM-R3] N80-25419
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[FE-3050-T2] N80-25421
Notch and hydrogen effects on sensitized 21-6-9 stainless steel
[DP-MS-79-22] N80-25422
Hydrogen charging effect on creep of pure iron
[COO-1367-107] N80-25425
Hydrogen embrittlement of metals. Citations from the American Petroleum Institute data base
[PB80-805963] N80-25439
Hydrogen embrittlement of metals, volume 2. Citations from the NTIS data base
[PB80-805948] N80-25440
Hydrogen embrittlement of metals, volume 3. Citations from the Engineering Index data base
[PB80-805955] N80-25441
HYDROGEN FUELS
Fluid processes in supersonic diffusion lasers N80-25648
HYDROGEN PLASMA
Stimulated Raman scattering from an underdense hydrogen plasma N80-26150
HYDROGEN PRODUCTION
Biological and synthetic systems for production of hydrogen from water — using hydrogenase with algae, chloroplasts, or synthetic catalysts
[PB80-148269] N80-25480
HYDROGEN RECOMBINATIONS
Shock-induced grain alignment in the Orion Nebula N80-25222
HYDROGEN SULFIDE
Hydrogen sulphide stress corrosion cracking in materials for geothermal power
[COO-2602-7] N80-25707
HYDROGENATION
Catalytic hydrogenation of coal-derived liquids
[FE-2034-17] N80-25398
Flash hydropyrolysis of coal
[BNL-51052] N80-25488
HYDROGRAPHY
The application of inverse methods to problems in ocean circulation
[PB80-148651] N80-26026
HYDROLOGY
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
New goals for snow monitoring by satellite N80-25745
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751

A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejos and South Fork River basins N80-25752
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753
Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759
Geophysical and hydrologic prediction of fissuring and land subsidence, south-central Arizona [PB80-151434] N80-25777
Estimating long-term statistics for annual precipitation for six regions of the United States from tree-ring data [UCRL-15162] N80-26005

HYDROLOGY MODELS
Hydrological and ecological models of shallow lakes and reservoirs [IIASA-CP-78-14] N80-25720
Discussion of questions related to hydrophysical and ecological modeling of shallow lakes and reservoirs N80-25721
Two examples of the use of hydrodynamic models in ecological studies — Lake Huron and Lake Erie water circulation N80-25724
Simulation model of an oligotrophic lake — Lake Onega N80-25728
Eutrophication modeling efforts for Lake Balaton — Hungary N80-25731
A hydrometeorological model for medium sized hydrographic basins [INPE-1729-TDL/025] N80-25897

HYDROMETEOROLOGY
Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749

HYPERFINE STRUCTURE
Studies in relativistic many-body perturbation theory for atomic systems: Hyperfine properties and forbidden optical transitions N80-26118

HYPERSONIC FLOW
Hypersonic slip-flow around slender elliptic cones at a slight angle of attack [DFVLR-FB-79-21] N80-25301

I

ICE
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska [NASA-TM-80662] N80-25763

ICE FORMATION
Simulated hail test facility [SAND-79-1114] N80-25349

ICE MAPPING
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska [NASA-TM-80662] N80-25763

IDAHO
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756

IGNITION
Laser spark ignition and extinction of a methane-air diffusion flame [SAND-79-8299] N80-[illegible].399
Comparison of ignition locations in a high swirl engine [SAND-79-8715] N80-25870

IMAGE ENHANCEMENT
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
Application of satellite data for snow mapping in Norway N80-25748

IMAGE PROCESSING
Communication satellite technology: State of the art and development opportunities [NASA-CR-159877] N80-25358
Geometry of Orbiting Earth Satellites (GOES) [AD-A082381] N80-25362
Computerized video densitometry method for rapid analysis of infrared photographic images — temperature distribution across a turbine blade [NASA-TP-1886] N80-25835
A medial axis transformation for grayscale pictures [AD-A081347] N80-25836
Advanced image compression study [AD-A082014] N80-25837
Innovations in digital image processing [AD-A082048] N80-25839
Image processing applications in NDE — X-ray inspection of microballoon laser targets [LA-UR-80-172] N80-25886
Geologic application of thermal-inertia mapping from satellite — Powder River Basin, Wyoming and Cabeza Prieta Arizona [E80-10151] N80-25733
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment [E80-10160] N80-25736
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee [E80-10165] N80-25740
Operational Applications of Satellite Snowcover Observations [E80-10167] N80-25742
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747
Pattern classification using charge transfer devices [NASA-CR-163237] N80-25760
Instrumentation and data processing used in Earth Resources Technology Satellites (ERTS), volume 2. Citations from the NTIS data base [PB80-805740] N80-25771
Algorithms for sample classification and image feature selection — remote sensing of Earth resources [INPE-1718-RPE/124] N80-26059
Partitioning multispectral imagery of the Earth resources [INPE-1678-RPE/111] N80-26060
As-built design specification of the data order processor ORDHDT [NASA-CR-160894] N80-26065

IMAGING TECHNIQUES
On optical imaging through aircraft turbulent boundary layers [AMP-334] N80-25596
Second moments of optical degradation due to a thin turbulent layer N80-25597
Correlation holography: Imaging of atoms when sigma sub (inelastic) sigma sub (elastic) [DOE/ER-70004/256] N80-25644
Viking orbiter stereo imaging catalog [NASA-CR-3277] N80-26240

IMPACT DAMAGE
The influence of ballistic damage on the aeroelastic characteristics of lifting surfaces — fighter aircraft [AD-A082536] N80-25322
Runway surface roughness N80-25326
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327
Parameters affecting aircraft performance on runways in bad condition N80-25329

IMPEDANCE MEASUREMENTS
Measurement of the mechanical impedance of human soft tissue in vivo N80-26031

IMPURITIES
The impurity resistivity of In doped CdS [INPE-1685-RPE/116-REV] N80-25391
Roles of the lower and upper Hubbard bands and the donor-excitonic states in the theory of shallow impurity states in doped semiconductors [INPE-1684-RPE/115] N80-26180

INCINERATORS
Test methods to determine the mercury emissions from sludge incineration plants [PB80-144811] N80-25954

INCOMPRESSIBLE BOUNDARY LAYER
Numerical solution of the incompressible Navier-Stokes equations about a three-dimensional body using boundary-fitted coordinates N80-25577

INDEPENDENT VARIABLES
Research on parallel estimators [CERT-1/7125-DERA] N80-26052

INDIUM ALLOYS
SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids [NASA-CR-161473] N80-25354

INDUCTION HEATING
Residual stress factors in torsional failure modes of inductionhardened steel axle shafts N80-25889

INDUCTORS
Comparison of flying compacitor bridge circuits and inductor-convertor bridge circuits for the transfer of energy between superconducting coils [CONF-791075-4] N80-25546

INDUSTRIAL ENERGY
Developmental research program for clean industrial and transportation fuels from coal: Milestone report on comparison of catalysts, March 1979 [FE-2514-M4] N80-25471
Cogeneration technology alternatives study. Volume 1: Summary report [NASA-CR-159758] N80-25792
Cogeneration technology alternatives study. Volume 2: Industrial process characteristics [NASA-CR-159760] N80-25793
Cogeneration technology alternatives study. Volume 4: Heat Sources, balance of plant and auxiliary systems [NASA-CR-159762] N80-25794
Cogeneration technology alternatives study. Volume 6: Computer data [NASA-CR-159764] N80-25795
Design of a system using CPC collectors to collect solar energy and to produce industrial process steam [ANL-79-102] N80-25814
Environmental development plan: Solar agricultural and industrial process heat [DOE/EDP-0033] N80-25882

INDUSTRIAL PLANTS
Solar total energy project Shenandoah [ALO-3985-1-REV-1] N80-25825
Guidance for lowest achievable emission rates from 18 major stationary sources of particulate, nitrogen oxides, sulfur dioxide, or volatile organic compounds [PB80-140262] N80-25948

INDUSTRIAL WASTES
Research to identify components of energy-related wastes: A state-of-the-art report — environment effects, bibliographies [PB80-137961] N80-25943
Mammalian toxicological evaluation of TNT wastewaters. Volume 2: Acute and subacute mammalian toxicity of TNT and LAP mixture [AD-A080957] N80-26034

INELASTIC COLLISIONS
Inelastic strong interactions at high energies [COO-2978-5] N80-26134

INELASTIC SCATTERING
Correlation holography: Imaging of atoms when sigma sub (inelastic) sigma sub (elastic) [DOE/ER-70004/256] N80-25644

INEQUALITIES
Inequalities for joint distribution of quadratic forms
[AD-A083033] N80-26090
INERTIA
Preliminary development of the Band Type Variable Inertia Flywheel (BVIF)
[SAND-79-7089] N80-25879
INERTIAL NAVIGATION
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
N80-25311
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
[AD-A082494] N80-25313
Colored measurement noise digital prefiltering by averaging
[DFVLR-MITT-79-08] N80-25316
INFORMATION DISSEMINATION
Clearinghouse and information resources offering utility-related products and services
[DOE/RG-10019/T1] N80-26196
INFORMATION RETRIEVAL
Browsing in large data bases
[AD-A081987] N80-26194
Applications of a reconfigurable array of flexible processors in intelligence information retrieval
[AD-A082324] N80-26195
INFRARED DETECTORS
Infrared fiber optics
[AD-A082450] N80-26141
INFRARED IMAGERY
HCMM: Soil moisture experiment — South Alberta, Canada
[E80-10166] N80-25741
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins
N80-25758
Satellite cloud climatological results, 1978: Comparison to 1976-77
[PB80-148117] N80-26019
INFRARED LASERS
Active/passive long wavelength infrared (LWIR) laser guidance
[AD-A082509] N80-25647
INFRARED PHOTOGRAPHY
Computerized video densitometry method for rapid analysis of infrared photographic images — temperature distribution across a turbine blade
[NASA-TP-1686] N80-25635
NASA-JSC ozone observations for validation of Nimbus 7-LIMS data
[NASA-TM-58227] N80-25985
INFRARED RADIATION
Shock-induced grain alignment in the Orion Nebula
N80-26222
The origin and relationship of the radio, infrared and visual radiation from compact nonthermal sources
N80-26249
INFRARED SPECTRA
Consequences of the mass spectrometric and infrared analysis of oils and asphaltenes for the chemistry of coal liquefaction. Characterization of coal-derived liquids and other fossil fuel related materials employing mass spectrometry
[FE-2537-10] N80-25460
Infrared fiber optics
[AD-A082450] N80-26141
INFRARED SPECTROSCOPY
Fourier transform infrared investigation of the structure and moisture stability of the epoxy matrix in glass-reinforced composites N80-25378
INHOMOGENEITY
New type of ray trajectory of thermal mode in an inhomogeneous magnetoplasma
[IPPJ-447] N80-26154
INLET FLOW
Laminar flow cyclone development program
[FE-3242-8] N80-25622
INORGANIC COMPOUNDS
Methods for analyzing inorganic compounds in particles emitted from stationary sources
[PB80-141781] N80-25936
INORGANIC SULFIDES
Thermophysical properties of inorganic polysulfides — applied to advanced batteries
[COO-10367-01] N80-25401
INSOLATION
The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25761
INSTRUMENT COMPENSATION
An alternate algorithm for correction of the scanning multichannel microwave radiometer polarization radiances using Nimbus-7 observed data
[NASA-TM-80672] N80-25762
INSULATION
Development of polyimide materials for use in solar energy systems
[DOE/CS-35305/T1] N80-25855
INSULATORS
Particle-initiated breakdown in gas dielectric cable insulation expanded scope program
[EPRI-EL-1264] N80-25553
INTEGRAL EQUATIONS
Properties of differential equations through different measures
[AD-A082633] N80-26091
INTEGRATED CIRCUITS
High reliability, low cost integrated circuits, phase 2 development report
[AD-A081666] N80-25539
High frequency analog LSI development
[AD-A082664] N80-25543
Performance of digital integrated circuit technologies at very high temperature
[SAND-79-2092C] N80-25550
Semiconductor measurement technology: Accurate linewidth measurements on integrated-circuit photomasks
[PB80-148216] N80-25564
INTEGRATED ENERGY SYSTEMS
Solar photovoltaic flat panel applications experiment at the Oklahoma Center for Science and Arts
[DOE/ET-23063/1] N80-25800
Solar project description for Peri-Mack Enterprises' single family residences, Denver, Colorado
[SOLAR/1015-79/50] N80-25821
West Chester Work Center: Solar space heating demonstration project
[DOE/CS-4048/2] N80-25822
Reliability, energy and cost effects of wind integration with conventional electrical generating systems
[CONF-791204-32] N80-25894
Analysis of community solar systems for combined space and domestic hot water heating using annual cycle thermal energy storage
[SERI/TP-255-570] N80-25900
INTERATOMIC FORCES
Thermodynamic properties of extended Hubbard model with strong intraatomic attraction and arbitrary electron density
[INPE-1726-NTE/158-REV] N80-26124
INTERCEPTION
A simple graphical model for analyzing radar homing interceptor engagements
[AD-A082480] N80-25528
INTERFACIAL TENSION
SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids
[NASA-CR-161473] N80-25354
Interfacial tension theory for low molecular weight and polymer systems N80-25444
INTERFEROMETRY
Milliarcsecond structure of nine compact extragalactic sources at 1671 MHz N80-26233
INTERGALACTIC MEDIA
X-rays from active galactic nuclei: Emission mechanisms and interaction with ambient media
N80-26247
INTERMETALLICS
The use of mechanical alloying in the manufacture of multifilamentary superconductor wire N80-25536
INTERMOLECULAR FORCES
Spectroscopic studies of molecular structure and intramolecular dynamics N80-26121
INTERNAL COMBUSTION ENGINES
Improving the performance and fuel consumption of dual chamber stratified charge spark ignition engines
[COO-4493-5] N80-25689
Comparison of ignition locations in a high swirl engine
[SAND-79-8715] N80-25670
Effects of microwaves on the performance of internal combustion engines
[SAN-1865-T1] N80-25672
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies — various hybrid/electric power train configurations and electrical and mechanical drive-line components
[NASA-CR-163227] N80-26203
Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report
[NASA-CR-163231] N80-26207
Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package
[NASA-CR-163232] N80-26208
INTERNATIONAL COOPERATION
AGARD highlights
[AD-A082980] N80-26262
INTERNATIONAL RELATIONS
World Energy Data System (WENDS). Volume 1: Country data, AF-CO
[ANL/PMS-79-2-VOL-1] N80-25827
World Energy Data System (WENDS). Volume 2: Country data, CZ-KS
[ANL/PMS-79-2-VOL-2] N80-25828
World Energy Data System (WENDS). Volume 2: Country data, LY-PO
[ANL/PMS-79-2-VOL-3] N80-25829
World energy data system (Wends). Volume 4: Country data, SG-YO
[ANL/PMS-79-2-VOL-4] N80-25830
INTERPLANETARY DUST
Background sky brightness measurements for application to space surveillance systems — zodiacal light and interplanetary dust
[AD-A081881] N80-26237
INTERPLANETARY MAGNETIC FIELDS
Magnetopause reconnection
[INPE-1667-RPE/106] N80-25973
Equatorial counterelectrojet: Two distinct categories
[INPE-1683-RPE/114] N80-25975
Solar-geophysical data number 423, part 1. Prompt Reports: Data for October 1979, September 1979
[PB80-148180-SGD-423-PT-1] N80-26244
INTERPLANETARY SPACE
Aspects of solar wind theories
[INPE 1636-RPE/095] N80-26243
INTERSTELLAR MATTER
The discovery of optical emission from the SNR G 126.2 + 1.6
[NASA-TM-80708] N80-26229
The evolution of supernova remnants in different galactic environments, and its effects on supernova statistics
[NASA-TM-80707] N80-26236
INTERVALS
Confidence interval robustness of correlation coefficient N80-26101
INTRAMOLECULAR STRUCTURES
Spectroscopic studies of molecular structure and intramolecular dynamics N80-26121
Thermodynamic properties of extended Hubbard model with strong intraatomic attraction and arbitrary electron density
[INPE-1726-NTE/158-REV] N80-26124
INVISCID FLOW
Stability of the laminar boundary layer on a blunted plate in supersonic flow N80-25292
Inviscid Flow Field Effects: Experimental results — optical distortions over airborne laser turrets
N80-25599
IO
Observations of electron gyroharmonic waves and the structure of the Io torus — Jupiter 1 spacecraft radio astronomy experiment
[NASA-TM-80696] N80-26231
ION ACCELERATORS
Ion extraction from a plasma
[NASA-CR-159849] N80-26161
ION EXTRACTION
Ion extraction from a plasma
[NASA-CR-159849] N80-26161
ION IMPLANTATION
Amorphous silicon solar cells by hydrogen implantation
[SAN-3042-1] N80-25842
ION MOTION
Effect of ion dynamics on relativistic nonlinear plasma oscillations
[INPE-1704-RPE/122-REV] N80-26151

Relativistic nonlinear cyclotron waves in a hot electron-ion plasma
[INPE-1723-RPE/128-REV] N80-26152

ION PROBES
An electro-optical ion detector for spark source mass spectrometry N80-25389

IONIC REACTIONS
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432

IONIZATION
Chemical ionization mass spectrometry
[AD-A081249] N80-25394
Chemical ionization mass spectrometry of nitroaromatic vapors
[AD-A081228] N80-25395
Collisional studies of ionization processes with heavy particle and photon
[AD-A082640] N80-26126

IONIZATION CHAMBERS
Two dimensional analysis of the photoionization chamber N80-26147

IONOSPHERE
Effects of rocket exhaust products in the thermosphere and ionosphere
[LA-8233-MS] N80-25922
Contribution to the study of electrostatic and electromagnetic waves near the lower hybrid frequency in ionospheric plasma
[CRPE-NT-61] N80-26173

IONOSPHERIC ELECTRON DENSITY
Longitudinal and latitudinal abnormalities in the daily variation of f0F2 in the South American region
[INPE-1722-RPE/127] N80-25969
Association between plasma bubble irregularities and airglow disturbances over Brazilian low latitudes
[INPE-1749-RPE/141] N80-25972

IONS
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083019] N80-25877
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083022] N80-25878
Oscillator strengths for highly ionized atomic systems
[COO-4264-13] N80-26130
Charge exchange measurements of ion behavior in the ISX Tokamak N80-26140
Two-dimensional equilibrium of field-reversed ion rings
[INPE-1724-RPE/129-REV] N80-26153

IRIDIUM ISOTOPES
Journal of research of the National Bureau of Standards, volume 85, no. 1 — aqueous electrolytes, iridium-192 gamma ray sources, air density at differing altitude, and isotopic abundance of thallium
[PB80-146566] N80-25377

IRON
Hydrogen charging effect on creep of pure iron
[COO-1367-107] N80-25425
Solarization of heliostat glasses
[SAND-79-8754] N80-25858

IRON ALLOYS
High temperature corrosion Studies. A. Iron: Based superalloy in SO2/O2 atmospheres. B. Gas: Solid reaction with formation of volatile species
[IS-T-993] N80-25430
superalloys, volume 3. Citations from the Engineering Index data base
[PB80-805849] N80-25437
Superalloys, volume 4. Citations from the Engineering Index data base
[PB80-805856] N80-25438

IRON COMPOUNDS
The role of iron and calcium in the cycling of phosphates in shallow lakes N80-25722

IRRADIATION
Alloy development for irradiation performance in fusion reactors
[COO-5098] N80-25426
Photoacoustic detection methods for characterizing laser irradiation and recrystallization of semiconductors
[ISM-282] N80-25552
Tensile properties of irradiated and unirradiated welds of A533 steel plate and A508 forgings
[NUREG-CR-1158] N80-25710

IRRIGATION
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25758

ISENTROPIC PROCESSES
Isentropic trajectories for derivation of objectively analysed meteorological parameters
[PB80-143118] N80-26018

ISLANDS
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763

ISOTHERMAL LAYERS
An experimental investigation of convection in a fluid that exhibits phase change
[NASA-TM-78277] N80-25813

ISOTOPES
Selenide isotope Generator for the Galileo mission. Heat pipe attachment technology
[TES-33009-45] N80-25832
Selenide isotope generator for the Galileo mission. GIG/Galileo hermetic receptacle test program
[TES-33009-47] N80-25833
Selenide isotope generator for the Galileo mission. SIG thermal insulation tests evaluation
[TES-33009-50] N80-25834
Selenide isotope generator for the Galileo mission. SIG hermetic bimetal weld transition joint
[TES-33009-51] N80-25835
The isotopic composition of cosmic rays N80-26250

ITALY
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment
[E80-10160] N80-25726
Italy: Estimates of future energy/GDP relationships
[ORAU/IEA(M)-79-20] N80-25804

ITERATION
On K-line and K x K block iterative schemes for a problem arising in 3-D elliptic difference equations
[AD-A082200] N80-26066
Algorithm to integrate systems of nonlinear ordinary differential equations, with application to the advanced Fiper code
[GA-A-15143] N80-26096

J

J-65 ENGINE
Localization of faults in jet engines by calculation of component characteristics N80-25279

JET AIRCRAFT NOISE
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915
USAF bioenvironmental noise data handbook. Volume 144: F-106A in-flight crew noise
[AD-A081845] N80-25916
USAF bioenvironmental noise data handbook. Volume 145: F-106B in-flight crew noise
[AD-A081847] N80-25917
USAF bioenvironmental noise data handbook. Volume 146: F-16B in-flight crew noise
[AD-A081848] N80-25918

JET ENGINES
Performance deterioration based on in-service engine data: JT9D jet engine diagnostics program
[NASA-CR-159525] N80-25340

JET IMPINGEMENT
Heat transfer to staggered arrays of impinging circular air jets N80-25571
Measured and predicted impingement noise for a model-scale under the wing external blown flap configuration with a OCSEE type nozzle
[NASA-TM-81494] N80-26115

JET PROPULSION
Technical evaluation report on the 54th(A) Propulsion and Energetics Panel Meeting on Advanced Control Systems for Aircraft Powerplants
[AGARD-AR-152] N80-25347

JOINTS (JUNCTIONS)
Explosively joining dissimilar metal tubes
[AD-A082068] N80-25683
Reliability and maintainability evaluation of solar collector and manifold interconnections
[SOLAR/0902-79/70] N80-25886

JOURNAL BEARINGS
Evaluation of new materials for rotor hub journal bearings — self lubricating materials
[AD-A082444] N80-25885

JUPITER (PLANET)
Observations of electron gyroharmonic waves and the structure of the Io torus — Jupiter 1 spacecraft radio astronomy experiment
[NASA-TM-80696] N80-26231

JUPITER ATMOSPHERE
Laminar and turbulent flow solutions with radiation and ablation injection for Jovian entry — radiative heating rates for the Galileo probe
[NASA-CR-163215] N80-26239

K

KALMAN FILTERS
Colored measurement noise digital prefiltering by averaging
[DFVLR-MITT-79-08] N80-25316

KANSAS
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737

KERNEL FUNCTIONS
Viscous thin airfoil theory
[NASA-CR-163069] N80-25299

KINEMATICS
Unified higher order path and envelope curvature theories in kinematics N80-26110

KINETIC ENERGY
Plasma aided techniques N80-25501

L

LAGRANGE MULTIPLIERS
Augmented Lagrangian methods for constrained optimization: The role of the penalty constant
[DOE/ER-05046/16] N80-26097

LAKE ERIE
Two examples of the use of hydrodynamic models in ecological studies — Lake Huron and Lake Erie water circulation N80-25724

LAKE HURON
Two examples of the use of hydrodynamic models in ecological studies — Lake Huron and Lake Erie water circulation N80-25724

LAKES
Hydrological and ecological models of shallow lakes and reservoirs
[NASA-CP-78-14] N80-25720
Discussion of questions related to hydrophysical and ecological modeling of shallow lakes and reservoirs N80-25721
The role of iron and calcium in the cycling of phosphates in shallow lakes N80-25722
The modeling of aquatic ecosystems of shallow lakes exchanging matter with sediment and with neigboring bodies of water N80-25725
Simulation model of an oligotrophic lake — Lake Onega N80-25728
Evaluation of available phosphorus models — phosphorus loading in lakes N80-25729
Theoretical investigations into the development of an intensively used shallow lake with a river flowing into it N80-25730
Eutrophication modeling efforts for Lake Balaton — Hungary N80-25731
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763

LAMINAR FLOW
Two numerical methods for steady stratified shear flows over an obstacle N80-25568
Finite element analysis of laminar convective heat transfer N80-25574

Laminar flow cyclone development program
[FE-3242-8] N80-25622
Heating a fluid in full flow inside a horizontal cyclindrical pipe using solar energy
[INPE-1660-TDL/020] N80-25796
Laminar and turbulent flow solutions with radiation and ablation injection for Jovian entry — radiative heating rates for the Galileo probe
[NASA-CR-163215] N80-26228

LAMINATES
Sudden bending of cracked laminates
[NASA-CR-159860] N80-25384
Use of thin glass reflectors for solar concentrators
[SAND-80-0109C] N80-25857

LAND
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
An energy-balance climate model with separate land and oceanic effects N80-25962

LAND USE
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735
Contributions of urban land use to stream water quality
[PB80-151178] N80-25942
Physical alterations of coastal shorelines: An analysis of Chesapeake Bay shore zone development and regulation
[PB80-149875] N80-25958

LANDING AIDS
Visual problems and night landing guidance of the CH-47 (Chinook) helicopter
[ARL/SYS-TM-50] N80-25312

LANDING GEAR
High-speed T-38A landing gear extension loads
[NASA-TM-58226] N80-25319

LANDSAT D
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759

LANDSAT SATELLITES
Instrumentation and data processing used in Earth Resources Technology Satellites (ERTS), volume 2. Citations from the NTIS data base
[PB80-805740] N80-25771

LANGUAGES
Sequential control structure abstractions for programming languages N80-26049

LANTHANUM ALLOYS
Superconductivity in the lanthanum-yttrium-manganese alloy system
[IS-T-895] N80-25554

LAPLACE EQUATION
A comparison of finite difference methods for solving Laplace's equation on curvilinear coordinate systems
[NASA-CR-163236] N80-26089

LARGE AREA CROP INVENTORY EXPERIMENT
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737

LASER ANEMOMETERS
Experimental investigation of the particle-number concentration in the wind tunnel for use of the laser anemometry
[DFVLR-FB-79-28] N80-25352
The measurement of turbulence with the burst-type laser Doppler anemometer: Errors and correction methods N80-25569

LASER APPLICATIONS
Laser spark ignition and extinction of a methane-air diffusion flame
[SAND-79-8288] N80-25399
Optical phase distortion due to compressible flow over laser turrets N80-25598
Inviscid Flow Field Effects: Experimental results — optical distortions over airborne laser turrets N80-25599
Lear jet boundary layer/shear layer laser propagation experiments N80-25602
Summary of aerodynamic vibration effects on ALL turret N80-25607
Flow visualization techniques in the Airborne Laser Laboratory program N80-25608
Aero-optics overview — laser applications N80-25612

LASER FUSION
Laser surface alloying N80-25504
Laser program, volume 3 — laser fusion
[UCRL-50021-78-VOL-3] N80-25650
Laser program, volume 2 — laser fusion
[UCRL-50021-78-VOL-2] N80-25651
Laser program, volume 1 — laser fusion
[UCRL-50021-78-VOL-1] N80-25652
Effect of nonlinear refraction on beam brightness in laser fusion applications
[LA-UR-80-417] N80-25655

LASER GUIDANCE
Active/passive long wavelength infrared (LWIR) laser guidance
[AD-A082509] N80-25647

LASER HEATING
Laser heating of a molecular gas channel
[SAND-80-0154] N80-25694
Axial laser heating of three meter theta pinch plasma
[MSNW-79-1045-5] N80-26189

LASER PLASMA INTERACTIONS
Particle simulation studies on behavior of laser-produced high-beta plasma in a magnetic field
[IPPJ-452] N80-26160
Microwave scaling of laser plasma interactions
[DOE/DP-40067/T1] N80-26168

LASER SPECTROSCOPY
Stark effect spectrophone for continuous absorption spectra monitoring
[NASA-CASE-NPO-15102-1] N80-25538

LASER TARGETS
Image processing applications in NDE — X-ray inspection of microballoon laser targets
[LA-UR-80-172] N80-25686

LASER WELDING
Laser surface alloying N80-25504

LASERS
Photoacoustic detection methods for characterizing laser irradiation and recrystallization of semiconductors
[ISM-262] N80-25552
Aero-optical characterization of aircraft optical turrets by holography, interferometry and shadowgraph N80-25593
Optimized laser turrets for minimum phase distortion N80-25600
Cycle II.5 aircraft aero-optical turbulent boundary-layer/shear-layer measurements N80-25605
Fluid processes in supersonic diffusion lasers N80-25646
Comparison of ignition locations in a high swirl engine
[SAND-79-8715] N80-25670
Stimulated Raman scattering from an underdense hydrogen plasma N80-26150

LASING
Turbulent two-dimensional jet flow and its effect on laser beam degradation N80-25589
Line spread instrumentation for propagation measurements N80-25592
The effect of atmospheric particulate matter on the propagation of a laser beam
[AD-A083039] N80-25648

LATTICE PARAMETERS
Lattice dynamics with short-range correlations applied to two-phonon Raman scattering N80-26175

LATTICES (MATHEMATICS)
Monte Carlo simulations of lattice gauge theories
[BNL-27323] N80-26185

LEAD ACID BATTERIES
Research, development and demonstration of lead-acid batteries for electric vehicle propulsion
[ANL/OEPM-78-8] N80-25801

LEAD ALLOYS
Thermal fatigue evaluation of solder alloys
[BDX-613-2341] N80-25429

LEAST SQUARES METHOD
Performance comparisons of several adaptive least mean square algorithms N80-26051

LENS ANTENNAS
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 2: Appendices
[AD-A081133] N80-25315

LIFE SCIENCES
Research on data analysis in the physical sciences
[COO-2310-6] N80-26111

LIFT AUGMENTATION
Large-scale wind-tunnel tests of inverting flaps on a STOL utility aircraft model
[NASA-TP-1696] N80-25318

LIFT DEVICES
The influence of ballistic damage on the aeroelastic characteristics of lifting surfaces — fighter aircraft
[AD-A082536] N80-25322

LIGHT CURVE
Light curve of type I supernovae
[LA-UR-80-463] N80-26232

LIGHT SCATTERING
Feasibility studies for light scattering experiments to determine the velocity relaxation of small particles in a fluid
[NASA-CR-163214] N80-25586
The effect of atmospheric particulate matter on the propagation of a laser beam
[AD-A083039] N80-25648
Stimulated Raman scattering from an underdense hydrogen plasma N80-26150
Lattice dynamics with short-range correlations applied to two-phonon Raman scattering N80-26175

LIGHT TRANSMISSION
Second moments of optical degradation due to a thin turbulent layer N80-25597
Optical phase distortion due to compressible flow over laser turrets N80-25598
Inviscid Flow Field Effects: Experimental results — optical distortions over airborne laser turrets N80-25599
Optimized laser turrets for minimum phase distortion N80-25600
Overview of recent aero-optics flight tests N80-25601
Lear jet boundary layer/shear layer laser propagation experiments N80-25602
Optical measurements of degradation in aircraft boundary layers N80-25603

LIMNOLOGY
Theoretical investigations into the development of an intensively used shallow lake with a river flowing into it N80-25730

LINCOLN EXPERIMENTAL SATELLITES
Thermoelectric generator testing and RTG degradation mechanisms evaluation
[SAN-0959-T2] N80-25809

LINE SPECTRA
Spectroscopic study of turbulent heating in the high beta Tokamak, Torus 2
[COO-2456-70] N80-26184
Calculations of NLTE carbon 2-4 spectra in line-blanketed model atmospheres of early-type stars N80-26225
High resolution spectroscopy of two gamma-ray bursts in November 1978
[NASA-TM-80575] N80-26252
Nuclear gamma ray lines from supernovae
[INPE-1665-RPE/105] N80-26254

LINEAR EQUATIONS
Linear equations in general purpose codes for stiff ODEs
[SAND-80-0429] N80-26093

LINEAR PROGRAMMING
A direct search procedure using linear programming to generate numerical suboptimal solutions in control problems
[INPE-1725-RPE/130] N80-26062

LINEAR SYSTEMS
Numerical bracketing of the Eigenvalues of complex linear structures N80-26260

LINES OF FORCE
Flux-line-cutting threshold in type-2 superconductors
[IS-T-894] N80-25493

LIQUID CHROMATOGRAPHY
A rapid analysis of surface waters by high pressure liquid chromatography
[PB80-132681] N80-25949

LIQUID CRYSTALS
An experimental investigation of convection in a fluid that exhibits phase change
[NASA-TM-76277] N80-25613

LIQUID HELIUM
Viscosity of He3 in superfluid and Fermi liquid regimes N80-25482

LIQUID HYDROGEN
Liquid hydrogen-fueled vehicle project
[LA-UR-79-2663] N80-25467

LIQUID METAL FAST BREEDER REACTORS
Thermophysical properties of sodium — liquid metal fast breeder reactors
[ANL/CEN/RSD-79-1] N80-25402
LIQUID PHASES
SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids
[NASA-CR-161473] N80-25354
Gallium arsenide epitaxial growth, volume 2. Citations from the NTIS data base
[PB80-805583] N80-26189
Gallium arsenide epitaxial growth, volume 3. Citations from the Engineering Index data base
[PB80-805591] N80-26190
LIQUID SODIUM
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 1: Executive summary
[SAN-1483-1/1] N80-25875
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 2, book 1: Commercial plant conceptual design
[SAN-1483-1/2] N80-25876
LIQUID-LIQUID INTERFACES
Motion of a sphere in the presence of a plane interface. 1: Modeling of non-isothermal turbulent flows, 2 N80-25582
LITHIUM
Nuclear interactions of low energy lithium ions
[COO-10409-1] N80-26137
LITHIUM SULFUR BATTERIES
Mathematical modeling of the lithium aluminum, iron sulfide battery
[LBL-10197] N80-25845
LITHOLOGY
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10183] N80-25736
LOADS (FORCES)
Equations for determining aircraft motions for accident data
[NASA-TM-78609] N80-25306
Aircraft dynamic response to damaged runways
[AGARD-R-685] N80-25325
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327
Parameters affecting aircraft performance on runways in bad condition N80-25328
Cold-air investigation of a 4 1/2 stage turbine with stage-loading factor of 4.66 and high specific work output. 2: Stage group performance
[NASA-TP-1688] N80-25338
Frictional damping at unlubricated metallic interfaces N80-25657
Dynamic responses of a multi-layered rectangular plate on viscoelastic foundation due to moving loads N80-25688
LONG RANGE WEATHER FORECASTING
Evaluation of the typical meteorological years for solar heating and cooling system studies
[SERI/TR-8150-1] N80-26001
LOOP ANTENNAS
Loop yagi array antennas N80-25517
LOUISIANA
Environmental assessment: Geothermal energy geopressure subprogram. DOE Sweet Lake no. 1, Cameron Parish, Louisiana
[DOE/EA-0065] N80-25929
LOW ASPECT RATIO
Study of blade aspect ratio on a compressor front stage
[NASA-CR-159556] N80-25333
LOW COST
High reliability, low cost integrated circuits, phase 2 development report
[AD-A081886] N80-25539
LOW GRAVITY MANUFACTURING
F-104 low-gravity calibration tests for materials processing in space precursory experiments
[NASA-TM-78278] N80-25355
LOW MOLECULAR WEIGHTS
Interfacial tension theory for low molecular weight and polymer systems N80-25444
LOW TEMPERATURE
Microwave surface impedance studies on copper at low temperature N80-25407
LOW TEMPERATURE PHYSICS
Solid state crystal physics at very low temperatures
[NASA-CR-163240] N80-26181
LOW TEMPERATURE TESTS
Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-84] N80-25429
Heating and cooling system — for fatigue test specimens
[NASA-CASE-LAR-12283-1] N80-25693
Fatigue testing machines. Citations from the International Aerospace Abstracts data base
[NASA-CR-162943] N80-25719
LOW VISIBILITY
Head-up transition behavior of pilots during simulated low-visibility approaches
[NASA-TP-1618] N80-26039
LUMINESCENCE
Development of materials for a luminescent solar collector
[COO-4998-1] N80-25812
LUMINOSITY
X-rays from active galactic nuclei: Emission mechanisms and interaction with ambient media N80-26247
LUNAR BASES
Space Colonies. Citations from the International Aerospace Abstracts data base
[NASA-CR-163204] N80-25353
LYMAN SPECTRA
Rocket observations of solar radiation during the eclipse of 26 February 1979
[NASA-CR-163211] N80-26242

M

MACHINE TOOLS
The testing and application of machinability criteria
[CSIR-TRANS-1457] N80-25483
MACHINE TRANSLATION
Development of Logoscan 2
[AD-A081921] N80-26067
MAGMA
Magma energy: A feasible alternative?
[SAND-80-0309C] N80-25859
MAGNETIC ANOMALIES
Comparison of f0F2 characteristics at nearby equatorial locations in the South American region
[INPE-1737-RPE/136] N80-25970
MAGNETIC DIPOLES
Design and application of a mega-moment electromagnetic dipole source — to geothermal exploration surveys
[LBL-9920] N80-25549
MAGNETIC FIELD CONFIGURATIONS
Two-dimensional equilibrium of field-reversed ion rings
[INPE-1724-RPE/129-REV] N80-26153
Negative shear ferromak for stabilization of current disruptions in toroidal discharge
[IPPJ-451] N80-26158
MAGNETIC FIELDS
Magnetic refrigeration for space applications: Report on a design study
[LA-8134] N80-25492
Flux-line-cutting threshold in type-2 superconductors
[IS-T-894] N80-25493
A diec LaB6 cathode for plasma production in magnetic field
[IPPJ-449] N80-26155
Particle simulation studies on behavior of laser-produced high-beta plasma in a magnetic field
[IPPJ-452] N80-26160
MAGNETIC FLUX
Flux-line-cutting threshold in type-2 superconductors
[IS-T-894] N80-25493
MAGNETIC MIRRORS
Magnetic confinement in plasmas in nuclear devices
[UCRL-52765] N80-26165
MAGNETIC MOMENTS
Design and application of a mega-moment electromagnetic dipole source — to geothermal exploration surveys
[LBL-9920] N80-25549
Nuclear magnetic resonance wide-line study of hydrogen in the yttrium-yttrium dihydride system
[IS-T-877] N80-26136
MAGNETIC TAPES
User/programmer guide to UCMD 64: Dumping drawing files to tape
[SAND-80-0156] N80-26076
MAGNETIZATION
Polarized LEED study of surface magnetism
[CONF-790909-15] N80-26187
MAGNETOHYDRODYNAMIC FLOW
Experimental investigation of gas flow dynamics of an inductively coupled argon plasma N80-26148
Convective heat transfer in MHD channels and its influence on channel performance
[CONF-800104-5] N80-26166
MAGNETOHYDRODYNAMIC GENERATORS
Power take-off analysis for diagonally connected MHD channels
[CONF-800104-6] N80-26167
MHD high performance demonstration experiment
[DOE/ET-2865/5] N80-26172
MAGNETOHYDRODYNAMIC WAVES
Nonlinear Alfven wave in an ultra-relativistic electron-positron plasma
[IPPJ-449] N80-26156
Waves in an ultra-relativistic electron-positron plasma
[IPPJ-450] N80-26157
Aspects of solar wind theories
[INPE 1636-RPE/095] N80-26243
MAGNETOHYDRODYNAMICS
Magnetohydrodynamics: A promising technology for efficiently generating electricity from coal, report to the Congress
[PB80-143175] N80-25910
Nonlinear evolution of the magnetohydrodynamic sheet pinch N80-26148
Modified NASA-Lewis chemical equilibrium code for MHD applications
[NASA-TM-80903] N80-26162
Numerical simulation studies of toroidal pinches
[COO-2456-57] N80-26163
MAGNETOPAUSE
The plasma boundary layer and magnetopause layer of the Earth's magnetosphere N80-25959
MAGNETOSPHERE
Effects of construction and operation of a satellite power system upon the magnetosphere — injection of orbit transfer vehicle exhaust
[ATR-80(7824)-1] N80-25365
Magnetopause reconnection
[INPE-1667-RPE/106] N80-25973
Observations of electron gyroharmonic waves and the structure of the Io torus — jupiter 1 spacecraft radio astronomy experiment
[NASA-TM-80696] N80-26231
MAGSAT A SATELLITE
Initial geomagnetic field model from MAGSAT
[NASA-TM-80679] N80-25967
MAINE
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
MAINTENANCE
Runway surface roughness N80-25326
MALAYA
Characteristics of the winter monsoon over the Malaysian region N80-25987
MAN ENVIRONMENT INTERACTIONS
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
MAN MACHINE SYSTEMS
Head-up transition behavior of pilots during simulated low-visibility approaches
[NASA-TP-1618] N80-26039
Flight-deck automation: Promises and problems
[NASA-TM-81206] N80-26040
MANAGEMENT METHODS
Applications of remote sensing to emergency management
[AD-A082243] N80-25765
Nuclear waste management: A perspective
[CONF-800117-1] N80-26135

MANAGEMENT PLANNING
Thermal energy storage
[NASA-TM-81514] N80-25779
MANEUVERABILITY
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327
MANGANESE ALLOYS
Superconductivity in the lanthanum-yttrium-manganese alloy system
[IS-T-895] N80-25554
MANIFOLDS
Reliability and maintainability evaluation of solar collector and manifold interconnections
[SOLAR/0902-79/70] N80-25886
MANUAL
Technical manual for engineers and scientists
[PB80-143266] N80-25498
MANY BODY PROBLEM
Studies in relativistic many-body perturbation theory for atomic systems: Hyperfine properties and forbidden optical transitions N80-26118
MAPS
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
MARINE BIOLOGY
Simulation model of an oligotrophic lake — Lake Onega N80-25728
Variations in phytoplankton physiological parameters during transient nitrogen environments N80-26027
MARINE ENVIRONMENTS
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432
MARINE METEOROLOGY
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
Mariners weather log, volume 23, no. 6
[PB80-145113] N80-26011
MARINE PROPULSION
Compact closed cycle Brayton system feasibility study, volume 1 — marine propulsion
[AD-A081379] N80-25666
MARINE TRANSPORTATION
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-138472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-138480] N80-26218
MARKET RESEARCH
Photovoltaic system costs using local labor and materials in developing countries
[NASA-CR-163218] N80-25785
SAGE, Solar Assisted Gas Energy
[PB80-144363] N80-25906
The 30/20 GHZ net market assessment
[NASA-CR-159837] N80-26109
Near hybrid passenger vehicle development program, phase 1. Appendices A and B. Mission analysis and performance specification studies report, volume 1
[NASA-CR-163330] N80-26201
MARS PHOTOGRAPHS
Images of Mars: The Viking extended mission
[NASA-SP-444] N80-26239
Viking orbiter stereo imaging catalog
[NASA-CR-3277] N80-26240
MASS DISTRIBUTION
Evaluation of available phosphorus models — phosphorus loading in lakes N80-25729
MASS FLOW
Design and cold-air test of single-stage uncooled turbine with high work output
[NASA-TP-1680] N80-25337
MASS SPECTRA
Consequences of the mass spectrometric and infrared analysis of oils and asphaltenes for the chemistry of coal liquefaction. Characterization of coal-derived liquids and other fossil fuel related materials employing mass spectrometry
[FE-2537-10] N80-25480
MASS SPECTROMETERS
A study of reactions in a time-of-flight mass spectrometer N80-25387
Use of mass spectroscopy for contamination control
[MLM-2686] N80-25405
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083019] N80-25977
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083022] N80-25978
MASS SPECTROSCOPY
An electro-optical ion detector for spark source mass spectrometry N80-25389
Chemical ionization mass spectrometry
[AD-A081249] N80-25394
Chemical ionization mass spectrometry of nitroaromatic vapors
[AD-A081228] N80-25395
Methods of evaluation of potentially hazardous organics in water
[PB80-135122] N80-25406
MASS TRANSFER
A photographic study of drop formation heat and mass transfer N80-25581
Periodic mass transfer in the X-ray binary system Her X-1/HZ Her N80-26227
MATHEMATICAL MODELS
Viscous thin airfoil theory
[NASA-CR-163069] N80-25299
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
[AD-A082494] N80-25313
Aircraft dynamic response to damaged runways
[AGARD-R-685] N80-25325
Summary and review of hydrogen theoretical equation-of-state models at Lawrence Livermore Laboratory
[UCID-18489] N80-25404
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432
Numerical modeling with a moving coordinate system: Application to flow through porous media — simulation of oil recovery processes N80-25580
Prediction of optical propagation losses through turbulent boundary/shear layers N80-25595
Mathematical model and the dynamic simulation of an electromechanical rotary device
[BDX-613-2376] N80-25667
Mechanical modeling of microstructural instabilities in cyclic viscoplasticity at variable temperatures
[ESA-TT-611] N80-25718
Mathematical modeling of the lithium aluminum, iron sulfide battery
[LBL-10197] N80-25845
Comparative method for the evaluation of array reflector materials
[ORNL/CSD-42] N80-25877
Modeling of buoyant plume dispersion in complex terrain
[PB80-145337] N80-25938
Performance measures and standards for air quality simulation models
[PB80-152638] N80-25950
Baroclinic wave vacillations N80-25960
Vector wind profile gust model
[NASA-CR-161474] N80-25992
Vector wind profile gust model
[NASA-CR-161475] N80-25993
A regional surface wind model for mountainous coastal areas
[PB80-146152] N80-26014
Continuous time series modeling with applications N80-26108
Two dimensional analysis of the photoionization chamber N80-26147
MATRICES (MATHEMATICS)
Investigation of routines for inverting block tridiagonal matrices
[SAND-80-8206] N80-26094
MAXIMUM ENTROPY METHOD
Maximum entropy spectral analysis of geomagnetic disturbing indices
[INPE-1683-RPE/120-REV] N80-26253
MAXWELL EQUATION
Mathematical methods in physics: Tensor analysis 3 — geodesy, Einstein's gravitational law, and the relativistic form of Maxwell equations
[INPE-1648-RPE/102-REV] N80-26088
MEASURE AND INTEGRATION
Properties of differential equations through different measures
[AD-A082633] N80-26091
MEASURING INSTRUMENTS
Semiconductor measurement technology: Comprehensive test pattern and approach for characterizing SOS technology
[PB80-147952] N80-25565
Line spread instrumentation for propagation measurements N80-25592
Rocket measurements of electron temperature in the E region
[NASA-CR-163210] N80-25964
MECHANICAL DRIVES
Continuously variable transmissions: Theory and practice
[UCRL-15037] N80-25988
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies — various hybrid/electric power train configurations and electrical and mechanical drive-line components
[NASA-CR-163227] N80-26203
MECHANICAL ENGINEERING
High bypass turbofan component development. Phase 2: Detailed design
[AD-A082753] N80-25341
Browsing in large data bases
[AD-A081987] N80-26194
MECHANICAL IMPEDANCE
Measurement of the mechanical impedance of human soft tissue in vivo N80-26031
MECHANICAL PROPERTIES
Investigation of the mechanical and corrosion properties of MA-87 aluminum powder alloy
[AD-A082457] N80-25418
Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-64] N80-25429
Hydrogen embrittlement of metals, volume 2. Citations from the NTIS data base
[PB80-805948] N80-25440
Corrosion of stainless steel, volume 2. Citations from the NTIS data base
[PB80-805906] N80-25442
MELTING
Single crystal growth of zirconia utilizing a skull melting technique
[AD-A082323] N80-26183
MELTS (CRYSTAL GROWTH)
Single crystal growth of zirconia utilizing a skull melting technique
[AD-A082323] N80-26180
MENTAL PERFORMANCE
Computerized adaptive performance evaluation
[AD-A082845] N80-26085
MERCURY (METAL)
Test methods to determine the mercury emissions from sludge incineration plants
[PB80-144611] N80-25954
MERIDIONAL FLOW
On the efficiency of meridional eddy transport processes during the major stratospheric warming of January 1977
[INPE-1687-RPE/118] N80-25968
MESONS
Charmed meson production and decay properties at the psi(3770)
[SLAC-219] N80-26127
MESOSCALE PHENOMENA
Introduction to interpreting satellite imagery
[INPE-1681-RPE/113] N80-25899
Texas HIPLEX interim progress report — high plains cooperative program for weather modification
[PB80-133101] N80-26009
A regional surface wind model for mountainous coastal areas
[PB80-146152] N80-26014
METAL AIR BATTERIES
Evaluation of air cathodes for potential use in development of aluminum-air cells
[UCID-18581] N80-25893
METAL COATINGS
Techniques of chemical vapor deposition N80-25502
METAL FATIGUE
Thermal fatigue evaluation of solder alloys
[BDX-613-2341] N80-25429

METAL HALIDES
Formation and transformation of polytypes in MX2 compounds
[INPE-1735-RPE/135] N80-26177
METAL HYDRIDES
Electronic structure, bonding and chemisorption in metallic hydrides
[LA-UR-80-458] N80-26184
METAL IONS
Air quality data for metals, 1976, from the National Air Surveillance Networks
[PB80-147432] N80-25951
METAL MATRIX COMPOSITES
Characterization of fatigue damage mechanisms in continuous fiber reinforced metal matrix composites N80-25379
Diffusion bonded boron/aluminum spar-shell fan blade
[NASA-CR-159571] N80-25382
METAL OXIDE SEMICONDUCTORS
Nanosecond pulsers for MM wave tubes
[AD-A080966] N80-25542
METAL POWDER
Tungsten and tungsten alloy powder metallurgy. Citations from the Engineering Index data base
[PB80-808029] N80-25435
METAL SURFACES
Fly ash erosion in gas turbine materials N80-25659
METAL VAPOR LASERS
Large scale copper vapor laser computer control system
[UCRL-82275] N80-25663
METAL WORKING
The use of mechanical alloying in the manufacture of multifilamentary superconductor wire N80-25536
METALLOGRAPHY
Forging evaluation of 304L stainless steel
[RFP-2807] N80-25420
METALS
A presentation for the deformation of a metal including the effects of strain hardening and recrystallization N80-25408
Explosively joining dissimilar metal tubes
[AD-A082068] N80-25663
Measurement and correlation of molecular metal pollutants in the air to existing weather conditions. Development of carbon atomizers for atomic absorption with high sensitivity and metal speciation capability N80-25913
METEOROLOGICAL BALLOONS
NASA-JSC ozone observations for validation of Nimbus 7-LIMS data
[NASA-TM-58227] N80-25665
METEOROLOGICAL CHARTS
Synoptic meteorology and air quality patterns in the St. Louis RAPS program
[PB80-148299] N80-26012
METEOROLOGICAL PARAMETERS
Meteorological effects on air pollution in Sao Paulo
[INPE-1689-RPE/107] N80-25914
Characteristics of the winter monsoon over the Malaysian region N80-25987
The 193088 MLRS, missile no. 1125, round no. V-98, 11 December 1979
[AD-A082969] N80-26000
Isentropic trajectories for derivation of objectively analyzed meteorological parameters
[PB80-143118] N80-26018
METEOROLOGICAL RADAR
Rain rate range profiling from a spaceborne radar
[NASA-TM-80656] N80-25989
Texas HIPLEX interim progress report — high plains cooperative program for weather modification
[PB80-133101] N80-26009
Texas HIPLEX, 1979: Field operations summary
[PB80-134471] N80-26010
Internal storm motions from a single non-Doppler weather radar
[PB80-143068] N80-26016
METEOROLOGICAL SATELLITES
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
Technical note APT/WEFAX 79-W2
[INPE-1727-NTE/150] N80-25995
METEOROLOGY
A diffusion climatology for Cape Canaveral, Florida
[NASA-TM-58224] N80-25994
Environmental satellite imagery
[PB80-153356] N80-26015
European Scientific notes, volume 34, no. 1
[AD-A081929] N80-26283
METHANE
Laser spark ignition and extinction of a methane-air diffusion flame
[SAND-79-8298] N80-25399
Synthetic fuels: Methane, volume 1. Citations from the Engineering Index data base
[PB80-805245] N80-25478
Synthetic fuels: Methane, volume 2. Citations from the Engineering Index data base
[PB80-805252] N80-25479
New electrolytes for direct methane fuel cells
[DOE/ET-11321/T1] N80-25891
METHYL ALCOHOLS
Catalytic conversion of methanol to low molecular weight hydrocarbons
[COO-4717-T1] N80-25470
METRICATION
Metrication in the United States. Citations from the NTIS data base
[PB80-806938] N80-25497
METROLOGY
European Scientific notes, volume 34, no. 1
[AD-A081929] N80-26283
MICROCOMPUTERS
Design of microcomputer adaptive controllers N80-26081
MICROCRACKS
Microcrack technology — core samples of granite in New Hampshire
[DOE/ER-04972/2] N80-25713
MICRODENSITOMETERS
Computerized video densitometry method for rapid analysis of infrared photographic images — temperature distribution across a turbine blade
[NASA-TP-1686] N80-25835
MICROELECTRONICS
Hybrid microelectronic circuits, volume 2. Citations from the NTIS data base
[PB80-805822] N80-25582
Hybrid microelectronic circuits, volume 3. Citations from the Engineering Index data base
[PB80-805930] N80-25583
Semiconductor measurement technology: Accurate linewidth measurements on integrated-circuit photomasks
[PB80-148216] N80-25584
MICROPHONES
Audio systems characteristics and minimum performance standards. Aircraft microphones (except carbon), aircraft headsets and speakers and aircraft audio selector panels and amplifiers
[RTCA-305-79/SC132-54-REV-2] N80-25514
Stark effect spectrophone for continuous absorption spectra monitoring
[NASA-CASE-NPO-15102-1] N80-25538
MICROPROCESSORS
Microprocessor self-diagnosis N80-26042
Low power NASA 36 bit time code generator
[NASA-TM-80697] N80-26045
MICROPROGRAMMING
A microprogrammable digital signal processor: Conception, design, application N80-26043
Read only memory optimization for microprogrammed digital computers N80-26044
Low power NASA 36 bit time code generator
[NASA-TM-80697] N80-26045
MICROSTRUCTURE
Section size effects on toughness of various cast steels N80-25410
Constitutive equations for polymers undergoing changes in microstructure with deformation N80-25443
Microstructures of structural ceramics N80-25445
High rate physical vapor deposition processes N80-25500
Plasma aided techniques N80-25501
Mechanical modeling of microstructural instabilities in cyclic viscoplasticity at variable temperatures
[ESA-TT-611] N80-25718
MICROWAVE ATTENUATION
A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design — tropospheric scattering
[NASA-CR-163207] N80-25520
MICROWAVE EMISSION
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759
MICROWAVE LANDING SYSTEMS
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 1
[AD-A081233] N80-25314
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 2: Appendices
[AD-A081133] N80-25315
MICROWAVE OSCILLATORS
Surface acoustic wave microwave oscillator and frequency synthesizer
[AD-A082351] N80-25544
MICROWAVE RADIOMETERS
An alternate algorithm for correction of the scanning multichannel microwave radiometer polarization radiances using Nimbus-7 observed data
[NASA-TM-80672] N80-25762
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
MICROWAVE SENSORS
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
MICROWAVE SWITCHING
Study of advanced communications satellite systems based on SS-FDMA
[NASA-CR-159778] N80-25357
MICROWAVE TRANSMISSION
Microwave scaling of laser plasma interactions
[DOE/DP-40067/T1] N80-26168
MICROWAVES
Microwave surface impedance studies on copper at low temperature N80-25407
Radar Microwave Link (RML) electromagnetic compatibility measurements
[AD-A083072] N80-25523
Effects of microwaves on the performance of internal combustion engines
[SAN-1865-T1] N80-25672
Preliminary environmental assessment for the Satellite Power System (SPS), revision 1. Volume 1: Executive summary
[DOE/ER-0036/1] N80-25874
Microwave fiber optics delay line
[AD-A082505] N80-26142
MIDLATITUDE ATMOSPHERE
Spaced lidar and nightglow observations of an atmospheric sodium enhancement
[INPE-1675-RPE/110] N80-25974
MILITARY AIRCRAFT
Experiences with a Flying Data Recording System (FRDS) in a German airforce fighter bomber wing after a troop fall N80-25276
Engine parameter trend analysis by LEADS 200: Possibilities and limitations N80-25277
MILLIMETER WAVES
Nanosecond pulsers for MM wave tubes
[AD-A080990] N80-25541
Nanosecond pulsers for MM wave tubes
[AD-A080966] N80-25542
MINERAL EXPLORATION
Remote sensing applied to petroleum and mineral exploration. Citations from the International Aerospace Abstracts data base
[NASA-CR-163311] N80-25770
MINES (EXCAVATIONS)
Economic baselines for current underground coal mining technology
[NASA-CR-163259] N80-25764
Remote electromagnetic sensing of underground coal burns
[FE-2414-8] N80-25767
Development of lightweight mine roof supports
[PB80-143936] N80-25774
MINICOMPUTERS
Computer program for elastic analysis of piping systems with special reference to the power piping code B31.1
[MT-135] N80-25697

LANAC: A high level language for data acquisition and process control by minicomputers
[INPE-1721-RPE/126] N80-26063
MINING
Economic baselines for current underground coal mining tcchnology
[NASA-CR-163259] N80-25764
MINNESOTA
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
Solar heating system installed at Telex Communications, Inc., Blue Earth, Minnesota
[NASA-CR-161437] N80-25786
MIRRORS
Silver deterioration in second surface solar mirrors
[SAND-79-8276] N80-25856
MISSILE COMPONENTS
Missile circumferential current density for plane wave electromagnetic field illumination
[AD-A082763] N80-25526
MISSILE CONTROL
Active/passive long wavelength infrared (LWIR) laser guidance
[AD-A082509] N80-25647
MISSILES
Drag measurements of conical afterbodies at subsonic and transonic speeds
[DFVLR-FB-79-27] N80-25302
MISSION PLANNING
EPS analysis of nominal STS-1 flight
[NASA-TM-81001] N80-25368
MCC level C formulation requirements. Entry guidance and entry autopilot, optional TAEM targeting
[NASA-TM-81072] N80-25369
MCC level C formulation requirements. Shuttle TAEM targeting
[NASA-TM-80796] N80-25370
STS-1 operational flight profile. Volume 5: Descent, cycle 3
[NASA-TM-81077] N80-25371
MISSISSIPPI
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25725
MISSOURI
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
Pollutant measurements in plumes from power plants and cities - St. Louis area, July 1976. A project MISTT (midwest sulfur transformation and transport) report
[PB80-139058] N80-25935
MODEMS
Digital sound: An investigation of delta-modulation/pulse-code-modulation -digital conversion
[BBC-RD-1980/3] N80-25518
MODULUS OF ELASTICITY
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163206] N80-25344
MOLECULAR BEAMS
Gallium arsenide epitaxial growth, volume 3. Citations from the Engineering Index data base
[PB80-805591] N80-26190
MOLECULAR COLLISIONS
Vibrational energy transfer by molecular collisions at high temperatures utilizing the diffusion cloud technique N80-26123
MOLECULAR DIFFUSION
Vibrational energy transfer by molecular collisions at high temperatures utilizing the diffusion cloud technique N80-26123
MOLECULAR GASES
Laser heating of a molecular gas channel
[SAND-80-0154] N80-25854
MOLECULAR INTERACTIONS
Collisional studies of ionization processes with heavy particle and photon
[AD-A082640] N80-26126
MOLECULAR SPECTROSCOPY
Review of Spectroscopic Data for Measurements of Stratospheric Species
[NASA-CP-2136] N80-26125
MOLECULAR STRUCTURE
Spectroscopic studies of molecular structure and intramolecular dynamics N80-26121
In-depth analysis of conformational changes in small ring molecules N80-26122
MOLECULAR WEIGHT
Use of mass spectroscopy for contamination control
[MLM-2686] N80-25405
Catalytic conversion of methanol to low molecular weight hydrocarbons
[COO-4717-T1] N80-25470
MOLTEN SALT ELECTROLYTES
High temperature fuel cell research and development
[SAN-1485-2] N80-25848
MOLTEN SALTS
High-temperature fuel cell research and development
[SAN-1485-T1] N80-25846
Fuel cell research on second-generation molten-carbonate systems
[SAN-11276-1] N80-25847
MOLYBDENUM ALLOYS
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[RR-79-9D9-HYTEM-R3] N80-25419
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[FE-3050-T2] N80-25421
MOMENTUM TRANSFER
On the efficiency of meridional eddy transport processes during the major stratospheric warming of January 1977
[INPE-1687-RPE/118] N80-25988
On the momentum transport by the stationary waves forced by the topography
[INPE-1720-RPE/125] N80-25990
MONOCOQUE STRUCTURES
A study of the reinforcement required for cutouts in aircraft semi-monocoque structure N80-25317
MONSOONS
Characteristics of the winter monsoon over the Malaysian region N80-25987
MONTANA
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
MONTE CARLO METHOD
Monte Carlo simulations of lattice gauge theories
[BNL-27323] N80-26185
MOON
Agreement governing the activities of states on the Moon and other celestial bodies, parts 1 and 2
[GPO-59-896] N80-26199
MOTOR VEHICLES
Funding for highway safety research, development, and demonstration in the National Highway Traffic Safety Administration
[PB80-137672] N80-26200
Gas turbine engines and transmissions for bus demonstration programs
[COO-4867-05] N80-26215
MOUNTAINS
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
A regional surface wind model for mountainous coastal areas
[PB80-146152] N80-26014
MULTIPROCESSING (COMPUTERS)
The complexity of parallel algorithms N80-26048
The structure of parallel algorithms
[AD-A081967] N80-26069
MULTISPECTRAL PHOTOGRAPHY
Partitioning multispectral imagery of the Earth resources
[INPE-1678-RPE/111] N80-26060
MULTIVARIATE STATISTICAL ANALYSIS
Statistical analysis of multivariate atmospheric variables — cloud cover
[NASA-CR-161472] N80-25991
Estimating long-term statistics for annual precipitation for six regions of the United States from tree-ring data
[UCRL-15162] N80-26005

N

NASA PROGRAMS
NASA geodynamics program
[NASA-TM-81978] N80-25988
Technical publications of the NASA-Wallops Flight Center, 1973 - 1979
[NASA-TM-73295] N80-26193
The Goddard program of gamma ray transient astronomy
[NASA-TM-80675] N80-26230
NATIONS
World Energy Data System (WENDS). Volume 1: Country data, AF-CO
[ANL/PMS-79-2-VOL-1] N80-25827
World Energy Data System (WENDS). Volume 2: Country data, CZ-KS
[ANL/PMS-79-2-VOL-2] N80-25828
World Energy Data System (WENDS). Volume 2: Country data, LY-PO
[ANL/PMS-79-2-VOL-3] N80-25829
World energy data system (Wends). Volume 4: Country data, SG-YO
[ANL/PMS-79-2-VOL-4] N80-25830
World Energy Data System (WENDS). Volume 5: International organization data
[ANL/PMS-79-2-VOL-5] N80-25831
NATURAL GAS
SAGE, Solar Assisted Gas Energy
[PB80-153836] N80-25907
NAVIER-STOKES EQUATION
An interaction algorithm for prediction of mean and fluctuating velocities in two-dimensional aerodynamic wake flows
[NASA-CR-3301] N80-25298
Resolution of Navier-Stokes equations by a space-time pseudo-spectral method N80-25487
Numerical solution of the incompressible Navier-Stokes equations about a three-dimensional body using boundary-fitted coordinates N80-25577
Development of the finite-differential numerical method and its application in two-dimensional Navier-Stokes equations N80-25583
NEAR FIELDS
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915
NEBULAE
Shock-induced grain alignment in the Orion Nebula N80-26222
The discovery of optical emission from the SNR G 126.2 + 1.8
[NASA-TM-80708] N80-26228
The evolution of supernova remnants in different galactic environments, and its effects on supernova statistics
[NASA-TM-80707] N80-26236
NEGATIVE FEEDBACK
The use of negative feedback and convolution integral in the control of nonlinear instability
[INPE-1733-RPE/133-REV] N80-26083
NETWORK ANALYSIS
REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program
[AD-A082735] N80-26072
The 30/20 GHZ net market assessment
[NASA-CR-159837] N80-26109
NEUTRAL BEAMS
A quick start of high current discharge from a cold LaB6 cathode for neutral beam injection
[IPPJ-453] N80-26159
NEUTRAL PARTICLES
Charge exchange measurements of ion behavior in the ISX Tokamak N80-26149
NEVADA
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756

NEW ENGLAND (US)
New England shelf/slope experiment. Data report: The moored array
[PB80-151640] N80-26025

NEW HAMPSHIRE
Microcrack technology — core samples of granite in New Hampshire
[DOE/ER-04972/2] N80-25713

NEW MEXICO
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
Solar energy system performance evaluation. Albuquerque Western no. 1, Albuquerque, New Mexico
[SOLAR/1011-79/14] N80-25818
Solar project description. Albuquerque Western-2 multi-dwelling building Albuquerque, New Mexico
[SOLAR/1080-79/50] N80-25819

NEW ZEALAND
Potential of energy farming for transport fuels in New Zealand
[NZERDC-46] N80-25456
Potential of energy farming for transport fuels in New Zealand, appendices
[NZERDC-46-APP] N80-25457
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746

NEWTONIAN FLUIDS
Porous media flow problems: Natural convection and non-Newtonian N80-25579

NICKEL ALLOYS
Thermal fatigue and oxidation data of oxide dispersion-strengthened alloys
[NASA-CR-159942] N80-25415
Superalloys, Volume 2. Citations from the NTIS data base
[PB80-805831] N80-25436
superalloys, volume 3. Citations from the Engineering Index data base
[PB80-805840] N80-25437
Superalloys, volume 4. Citations from the Engineering Index data base
[PB80-805856] N80-25438

NICKEL CADMIUM BATTERIES
Comparison of onboard aircraft Nicad battery chargers
[AD-A082515] N80-25840

NICKEL ZINC BATTERIES
Pulse charging of lead-acid traction cells
[NASA-TM-81513] N80-25780
Research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion
[ANL/OEPM-79-11] N80-25802

NIGHT VISION
Visual problems and night landing guidance of the CH-47 (Chinook) helicopter
[ARL/SYS-TM-50] N80-25312

NIGHTGLOW
Association between plasma bubble irregularities and airglow disturbances over Brazilian low latitudes
[INPE-1748-RPE/141] N80-25972
Spaced lidar and nightglow observations of an atmospheric sodium enhancement
[INPE-1675-RPE/110] N80-25974

NIMBUS SATELLITES
An alternate algorithm for correction of the scanning multichannel microwave radiometer polarization radiances using Nimbus-7 observed data
[NASA-TM-80572] N80-25782
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80982] N80-25783
NASA-JSC ozone observations for validation of Nimbus 7-LIMS data
[NASA-TM-58227] N80-25985

NIOBIUM
Anelastic studies of interstitially trapped hydrogen in niobium
[DOE/ER-01198/1289] N80-25427

NITRAMINE PROPELLANTS
Nitramine monopropellant deflagration and general nonsteady reacting rocket chamber flows N80-25373

NITRASOL EXPLOSIVES
Relation between the electronic structure and the shock sensitivity of nitrated secondary explosives. 3: Influence of the crystal environment
[UCRL-TRANS-11510] N80-25458

NITROGEN
Study of experiments on condensation of nitrogen by homogeneous nucleation at states modelling those on the national transonic facility
[NASA-CR-163217] N80-25294
Chemical ionization mass spectrometry of nitroaromatic vapors
[AD-A081228] N80-25365
Effects of various assumptions on the calculated liquid fraction in isentropic saturated equilibrium expansions
[NASA-TP-1662] N80-25915

NITROGEN DIOXIDE
Atmospheric distributions, sources and sinks of selected halocarbons, hydrocarbons, SF6, and N2O
[PB80-142706] N80-25834

NITROGEN METABOLISM
Variations in phytoplankton physiological parameters during transient nitrogen environments N80-26027

NITROGEN OXIDES
Homogeneous production and removal of NOx from combustion exhaust gases
[ARI-RP-52] N80-25820
Homogeneous production and removal of NOx from combustion exhaust gases — reaction rate over a temperature range
[ARI-RP-49] N80-25825

NITROUS OXIDES
Cross-country urban and rural measurements of NOx and SO2
[PB80-137227] N80-25955

NOAA SATELLITES
Environmental satellite imagery
[PB80-153256] N80-26015

NOISE GENERATORS
Noise on various noise sources N80-25486

NOISE PREDICTION (AIRCRAFT)
Measured and predicted impingement noise for a model-scale under the wing external blown flap configuration with a QCSEE type nozzle
[NASA-TM-81494] N80-26115

NOISE REDUCTION
Measured and predicted impingement noise for a model-scale under the wing external blown flap configuration with a QCSEE type nozzle
[NASA-TM-81494] N80-26115
Optimization of noise barriers
[DFVLR-FB-79-29] N80-26116

NONAQUEOUS ELECTROLYTES
Corrosion protection by electro-deposited aluminum N80-25505

NONDESTRUCTIVE TESTS
Evaluation of nondestructive inspection methods for aircraft tires
[AD-A082523] N80-25681
Image processing applications in NDE — X-ray inspection of microballoon laser targets
[LA-UR-80-172] N80-25686

NONLINEAR EQUATIONS
Baroclinic wave vacillations N80-25960
Approximation and numerical analysis of nonlinear equations of evolution
[AD-A082452] N80-26092

NONLINEAR SYSTEMS
Parallel processing algorithms for the identification, estimation and control of nonlinear dynamical systems N80-25534
The use of negative feedback and convolution integral in the control of nonlinear instability
[INPE-1733-RPE/133-REV] N80-26083

NONLINEARITY
A comparison of finite difference methods for solving Laplace's equation on curvilinear coordinate systems
[NASA-CR-163236] N80-26089

NORMAL DENSITY FUNCTIONS
Joint Gaussian probability plot program
[UCID-18513] N80-26106

NORMALIZING (STATISTICS)
Renormalizing the strong-coupling expansion for quantum field theory: Present status
[LA-UR-80-482] N80-26191

NORTHERN HEMISPHERE
Some observed and theoretical aspects of the sudden stratospheric heating in the Northern and Southern Hemispheres
[INPE-1671-TDL/018] N80-25976

NORWAY
Application of satellite data for snow mapping in Norway N80-25748

NOSE TIPS
Correlation of nosetip boundary-layer transition data measured in ballistics-range experiments
[SAND-79-0849C] N80-25626

NOTCH SENSITIVITY
Notch and hydrogen effects on sensitized 21-6-9 stainless steel
[DP-MS-79-22] N80-25422

NUCLEAR ELECTRIC POWER GENERATION
STARFIRE: A commerical Tokamak reactor
[ANL/FPP/TM-125] N80-26171

NUCLEAR INTERACTIONS
Nuclear interactions of low energy lithium ions
[COO-10409-1] N80-26137

NUCLEAR MAGNETIC RESONANCE
Nuclear magnetic resonance wide-line study of hydrogen in the yttrium-yttrium dihydride system
[IS-T-877] N80-26136

NUCLEAR MODELS
Some aspects of the Quark-Parton model in the weak and the strong interaction phenomenology N80-26117

NUCLEAR POWER PLANTS
Seismic safety margins research program load combination project. Task 3: Load combination methodology development
[UCID-18149] N80-25981

NUCLEAR REACTORS
Hot cell measuring and test equipment calibration control
[CONF-791103-73] N80-25842
Fatigue of weldments in nuclear pressure vessels and piping
[NUREG-CR-1351] N80-25706

NUCLEATION
Study of experiments on condensation of nitrogen by homogeneous nucleation at states modelling those on the national transonic facility
[NASA-CR-163217] N80-25294

NUCLEI
On the physical environment in galactic nuclei N80-26234

NUMERICAL ANALYSIS
An approximation and an associated numerical method for two-dimensional steady supersonic gas dynamics N80-25567
Two numerical methods for steady stratified shear flows over an obstacle N80-25568
Numerical computations of friction and heat transfer in free swirling pipe flow N80-25570
Numerical solution of the incompressible Navier-Stokes equations about a three-dimensional body using boundary-fitted coordinates N80-25577
Development of the finite-differential numerical method and its application in two-dimensional Navier-Stokes equations N80-25583
Suboptimal approximations for control in optimal dynamic programs — trajectory optimization for Earth-Mars or orbit transfer problems
[INPE-1676-TDL/019] N80-26086
New type of ray trajectory of thermal mode in an inhomogeneous magnetoplasma
[IPPJ-447] N80-26154

NUMERICAL CONTROL
Large scale copper vapor laser computer control system
[UCRL-82275] N80-25653

NUMERICAL FLOW VISUALIZATION
Unsteady aerothermodynamics modeling N80-25488

NUMERICAL INTEGRATION
Simulation of chemical reaction in a turbulent flow
[ISM-253] N80-25620

NUMERICAL WEATHER FORECASTING
Numerical weather prediction and its outlook in Brazil
[INPE-1670-RPE/108] N80-25996

NUTRIENTS
The modeling of nutrient exchange between sediment and water N80-25727

O

O STARS
Calculations of NLTE carbon 2-4 spectra in line-blanketed model atmospheres of early-type stars N80-26225

OCEAN BOTTOM
Geological and geotechnical investigation of sediment redistribution on the central equatorial Pacific seafloor N80-26021
New England shelf/slope experiment. Data report: The moored array [PB80-151640] N80-26025

OCEAN CURRENTS
New England shelf/slope experiment. Data report: The moored array [PB80-151640] N80-26025
The application of inverse methods to problems in ocean circulation [PB80-149651] N80-26026

OCEAN SURFACE
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska [NASA-TM-80662] N80-25763
The climatic impact of sea surface temperature anomalies on zonally symmetric and asymmetric flows: A quasi-geostrophic modeling approach N80-26022
GEOS-3 radar altimeter study for the South Atlantic Bight [NASA-TM-73396] N80-26023
Arc program documentation [NASA-CR-156867] N80-26054

OCEAN THERMAL ENERGY CONVERSION
OTEC support services [COO-4931-T11] N80-25799
Ocean energy systems. Fiscal year 1979 [DOE/ET-0118] N80-25824
Ocean thermal energy conversion ecological data report from OSS researcher in Gulf of Mexico, 12-23 July 1977 [LBL-8945] N80-25921

OCEANOGRAPHY
European Scientific notes, volume 34, no. 1 [AD-A081929] N80-26263

OCEANS
An energy-balance climate model with separate land and oceanic effects N80-25962

OCULOMETERS
An investigation of the feasibility of improving oculometer data analysis through application of advanced statistical techniques [NASA-CR-163238] N80-26055

OFFSHORE ENERGY SOURCES
Design study and economic assessment of multi-unit offshore wind energy conversion systems applications. Volume 4: Meteorological and oceanographic surveys [WASH-2330-78/4-VOL-4] N80-25836
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 2: Apparatus designs and costs [WASH-2330-78/4-VOL-2] N80-25838

OFFSHORE PLATFORMS
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 3: System analysis [WASH-2330-78/4-VOL-3] N80-25837

OHIO
Solar energy system performance evaluation: Seasonal report for Solaron-Akron, Akron, Ohio [NASA-CR-161465] N80-25791

OIL RECOVERY
Numerical modeling with a moving coordinate system: Application to flow through porous media — simulation of oil recovery processes N80-25580
Displacement of oil by carbon dioxide [DOE/MC-03260/4] N80-25768
Solar technology application to enhanced oil recovery [SERI/TR-352-392] N80-25839

OILS
Use of mass spectroscopy for contamination control [MLM-2686] N80-25405
Feasibility study of using a coal/water oil emulsion as a clean liquid fuel [FE-2437-T1-ADD] N80-25463

OKLAHOMA
Solar photovoltaic flat panel applications experiment at the Oklahoma Center for Science and Arts [DOE/ET-23063/1] N80-25800
Biogenic hydrocarbon contribution to the ambient air of selected areas - Tulsa; Great Smokey Mountains; Rio Blanco County, Colorado [PB80-139086] N80-25945

OMEGA NAVIGATION SYSTEM
Minimum performance standards: Airborne Omega receiving equipment [RTCA/DO-184A] N80-25310

OPENINGS
A study of the reinforcement required for cutouts in aircraft semi-monocoque structure N80-25317

OPERATING SYSTEMS (COMPUTERS)
Modelling and resource allocation of linearly restricted operating systems [AD-A082363] N80-26048
User/programmer guide to UCMD 64: Dumping drawing files to tape [SAND-80-0156] N80-26076

OPERATIONS RESEARCH
Synthane pilot plant, South Park Township, Pennsylvania [COO-0003-41-T1] N80-25455
Minimum performance standards: Emergency locator transmitters: Automatic Fixed-ELT (AF), Automatic Portable-ELT (AP), Automatic Deployable-ELT (AD) operating on 121.5 and 243.0 megahertz [RTCA/DO-168] N80-25511
An application of software design and documentation language — Galileo spacecraft command and data subsystem [NASA-CR-162258] N80-26057
REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program [AD-A082735] N80-26072
European Scientific notes, volume 34, no. 1 [AD-A081929] N80-26263

OPTICAL COMMUNICATION
Infrared fiber optics [AD-A082450] N80-26141

OPTICAL EMISSION SPECTROSCOPY
The discovery of optical emission from the SNR G 126.2 + 1.6 [NASA-TM-80706] N80-26228

OPTICAL EQUIPMENT
Aero-optics overview — laser applications N80-25612

OPTICAL MICROSCOPES
Semiconductor measurement technology: Accurate linewidth measurements on integrated-circuit photomasks [PB80-148216] N80-25564

OPTICAL PROPERTIES
Selective paint development — solar energy absorbers [ALO-4267-T2] N80-25448
Apodization of optical systems with poor resolving power N80-26139
Optical properties of metallic surfaces, small particles and composite coatings for solar energy conversion applications [DOE/ET-20413/1] N80-26143

OPTICAL SCANNERS
Development of Logoscan 2 [AD-A081921] N80-26057

OPTIMAL CONTROL
A direct search procedure using linear programming to generate numerical suboptimal solutions in control problems [INPE-1725-RPE/130] N80-26052
Optimal linear estimation applied to generate suboptimal numerical solutions for control problems [INPE-1731-RPE/131] N80-26084
Suboptimal approximations for control in optimal dynamic programs — trajectory optimization for Earth-Mars or orbit transfer problems [INPE-1678-TDL/019] N80-26086

OPTIMIZATION
Structural layout with stress-displacement and fabrication limits N80-25700
Augmented Lagrangian methods for constrained optimization: The role of the penalty constant [DOE/ER-05046/16] N80-26097

ORBIT CALCULATION
A method of producing analytical orbit models for geostationary satellites [DFVLR-FB-79-16] N80-25388

ORBIT TRANSFER VEHICLES
Effects of construction and operation of a satellite power system upon the magnetosphere — injection of orbit transfer vehicle exhaust [ATR-80(7824)-1] N80-25365

ORBITAL ASSEMBLY
The solar power satellite concepts: The past decade and the next decade [NASA-TM-81000] N80-25360

OREGON
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25758
Coastal upwelling ecosystems analysis. Physical dynamics of the coastal upwelling frontal zone off Oregon [PB80-139843] N80-26024

ORGANIC COMPOUNDS
Methods of evaluation of potentially hazardous organics in water [PB80-135122] N80-25406
Radiation effects on organic insulators for superconducting magnets [ORNL/TM-7077] N80-25551

ORION CONSTELLATION
Shock-induced grain alignment in the Orion Nebula N80-26222

ORTHOPHOTOGRAPHY
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755

OSCILLATORS
Oscillator strengths for highly ionized atomic systems [COO-4264-13] N80-26130

OUTER SPACE TREATY
Agreement governing the activities of states on the Moon and other celestial bodies, parts 1 and 2 [GPO-59-896] N80-26199

OXIDATION
Reaction rate self-oscillations during the oxidation of hydrogen over nickel N80-25390
High temperature corrosion Studies. A. Iron: Based superalloy in SO2/O2 atmospheres. B. Gas: Solid reaction with formation of volatile species [IS-T-993] N80-25430

OXIDE FILMS
Mechanical and dielectric properties of optical films [UCRL-15098] N80-26144

OXIDES
Fabrication and diagnostics of oxide tunneling barriers in niobium based superconductive tunnel junctions N80-26176

OXIDIZERS
Fluid processes in supersonic diffusion lasers N80-25848

OXYGEN
Oxygen reduction on a graphite paste and a catalyst loaded graphite paste electrode [IS-T-896] N80-25898

OXYGEN CONSUMPTION
The relationship of exercise performance to variations in blood acid-base status induced by changes in the inspired oxygen fraction N80-26030

OZONE
Assessment of vertical distributions of photochemical pollutants and meteorological variables in the vicinity of urban areas [PB80-139918] N80-25933
Transfer standards for the calibration of ambient air monitoring analyzers for ozone: Technical assistance document [PB80-146871] N80-25941
NASA-JSC ozone observations for validation of Nimbus 7-LIMS data [NASA-TM-58227] N80-25965

P

P-3 AIRCRAFT
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763

PACIFIC NORTHWEST (US)
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Deerchak, Libby and Hungry Horse River Basins N80-25750

PACIFIC OCEAN
Geological and geotechnical investigation of sediment redistribution on the central equatorial Pacific seafloor N80-26021

PAINTS
Selective paint development — solar energy absorbers
[ALO-4287-T2] N80-25448

PANEL METHOD (FLUID DYNAMICS)
Development and validation of a combined rotor fuselage induced flow field computational method — Langley V/STOL tunnel
[NASA-TP-1656] N80-25296

PARABOLIC REFLECTORS
Design and test of non-evacuated solar collectors with compound parabolic concentrators
[EFI-79-42] N80-25811

PARACHUTES
Parachutes and decelerators, volume 2. Citations from the NTIS data base
[PB80-806946] N80-25305

PARALLEL PROCESSING (COMPUTERS)
Parallel processing algorithms for the identification, estimation and control of nonlinear dynamical systems N80-25534
The complexity of parallel algorithms N80-26048

PARALLEL PROGRAMMING
The structure of parallel algorithms
[AD-A081967] N80-26069

PARAMETERIZATION
On problems of estimation for two parameter decreasing failure rate distributions applied to reliability
[AD-A082991] N80-25682

PARTIAL DIFFERENTIAL EQUATIONS
Development of the finite-differential numerical method and its application in two-dimensional Navier-Stokes equations N80-25593
Investigation of routines for inverting block tridiagonal matrices
[SAND-80-8206] N80-26094

PARTICLE COLLISIONS
Collisional studies of ionization processes with heavy particle and photon
[AD-A082640] N80-26126

PARTICLE DENSITY (CONCENTRATION)
Experimental investigation of the particle-number concentration in the wind tunnel for use of the laser anemometry
[DFVLR-FB-79-29] N80-25352

PARTICLE INTERACTIONS
Phonon-dislocation interaction
[COO-1198-1281] N80-26128

PARTICLE MOTION
Feasibility studies for light scattering experiments to determine the velocity relaxation of small particles in a fluid
[NASA-CR-163214] N80-25586

PARTICLE PRODUCTION
Charmed meson production and decay properties at the psi(3770)
[SLAC-219] N80-26127

PARTICLE SIZE DISTRIBUTION
Evaluation of stationary source particulate measurement methods. Volume 4: Basic oxygen furnaces
[PB80-141833] N80-25937

PARTICLE THEORY
Inelastic strong interactions at high energies
[COO-2978-5] N80-26134

PARTICLES
The effect of atmospheric particulate matter on the propagation of a laser beam
[AD-A083039] N80-25949
Air quality data for metals, 1976, from the National Air Surveillance Networks
[PB80-147432] N80-25951

PARTICULATE SAMPLING
Particulate sampling and support: Executive summary
[PB80-149683] N80-25958

PARTONS
Some aspects of the Quark-Parton model in the weak and the strong interaction phenomenology N80-26117

PATTERN RECOGNITION
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment
[E80-10160] N80-25736
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
Pattern classification using charge transfer devices
[NASA-CR-163237] N80-25760
Algorithms for sample classification and image feature selection — remote sensing of Earth resources
[INPE-1718-RPE/124] N80-26059
Partitioning multispectral imagery of the Earth resources
[INPE-1679-RPE/111] N80-26060

PATTERN REGISTRATION
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757

PAVEMENTS
A review of fabric usage in pavements constructed on low-strength soils
[AD-A083076] N80-25484
Assessment of methods for control of fugitive emissions from paved roads
[PB80-139330] N80-25495
Permanent deformation of cohesionless subgrade material under cyclic loading N80-25692

PENALTIES
Augmented Lagrangian methods for constrained optimization: The role of the penalty constant
[DOE/ER-05046/16] N80-26097

PENNSYLVANIA
West Chester Work Center: Solar space heating demonstration project
[DOE/CS-4048/2] N80-25822

PERCHLORATES
Measurement of perchloroethylene in ambient air
[PB80-144679] N80-25953

PERFORMANCE
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
[AD-A082494] N80-25313

PERFORMANCE PREDICTION
Performance deterioration based on in-service engine data: JT9D jet engine diagnostics program
[NASA-CR-159525] N80-25340
Performance prediction of power augmented electrothermal hydrazine thrusters
[TUM-LRT-KB-78/1] N80-25375
Minimum performance standards: Emergency locator transmitters: Automatic Fixed-ELT (AF), Automatic Portable-ELT (AP), Automatic Deployable-ELT (AD) operating on 121.5 and 243.0 megahertz
[RTCA/DO-168] N80-25511

PERFORMANCE TESTS
Minimum performance standards: Airborne Omega receiving equipment
[RTCA/DO-164A] N80-25310
Environmental conditions and test procedures for airborne equipment
[RTCA-309-79/SC135-41] N80-25329
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163206] N80-25344
Evaluation of existing flammability test methods by comparison of the flammability characteristics of interior materials
[AD-A083137] N80-25393
Performance evaluation of a selected three-ton air-to-air heat pump in the heating mode
[ORNL/CON-34] N80-25630
Performance evaluation of Magma Power company's reinjection well no. 48-7 at the East Mesa KGRA, California
[SAND-79-7127] N80-25883

PERIODIC FUNCTIONS
Synchronization of weakly coupled relaxation oscillators — starting with Mishchenko's theorem
[MC-TW-180/78] N80-26098

PERIODIC VARIATIONS
Maximum entropy spectral analysis of geomagnetic disturbing indices
[INPE-1693-RPE/120-REV] N80-26253

PERMAFROST
Determination of selected hydraulic properties of subarctic soils
[PB80-150956] N80-25983

PERMEATING
New mathematical technique for determining the parameters of gas permeation through solids
[GEPP-OP-474] N80-25821

PERTURBATION THEORY
Stability of the laminar boundary layer on a blunted plate in supersonic flow N80-25292
A method of producing analytical orbit models for geostationary satellites
[DFVLR-FB-79-16] N80-25366
Theoretical equations of state for the rare gases
[LA-8062] N80-25396
The inverse scattering problem for perturbed wave equations N80-25515
Application of functional analysis to perturbation theory of differential equations — nonlinear perturbation of the harmonic oscillator
[NASA-TM-81073] N80-26087
Studies in relativistic many-body perturbation theory for atomic systems: Hyperfine properties and forbidden optical transitions N80-26118
Relativistic many body perturbation theory: Application to spin-Hamiltonian parameters of atoms and ions with half-filled shells N80-26119
Moller-Plesset electron correlation studies of atoms and small molecules N80-26120
Eigenvalues for unstable resonators with slightly misaligned strip mirrors
[INPE-1738-RPE/137-REV] N80-26140

PETROLOGY
Design and construction of the Boyd-England high pressure apparatus
[NPL-CHEM-110] N80-25834

PHARMACOLOGY
Chances of detecting and differentiating central system effects of drugs in animal experiments with special consideration of behavioural pharmacological methods
[RAE-LIB-TRANS-2034] N80-26029
Various techniques for evaluating cardiodynamic function using chronically instrumented canine models
[AD-A071264] N80-26035

PHASE DEVIATION
Optical phase distortion due to compressible flow over laser turrets N80-25598
Optimized laser turrets for minimum phase distortion N80-25600

PHASE DIAGRAMS
Thermodynamic properties of extended Hubbard model with strong intraatomic attraction and arbitrary electron density
[INPE-1726-NTE/158-REV] N80-26124

PHASE TRANSFORMATIONS
A photographic study of drop formation heat and mass transfer N80-25581
An experimental investigation of convection in a fluid that exhibits phase change
[NASA-TM-78277] N80-25613
Displacement of oil by carbon dioxide
[DOE/MC-03260/4] N80-25768

PHASED ARRAYS
Shuttle Ku-band and S-band communications implementation study
[NASA-CR-160662] N80-25522
Wideband adaptive antenna nulling using tapped delay lines
[AD-A082854] N80-25527

PHOBOS
Images of Mars: The Viking extended mission
[NASA-SP-444] N80-26239

PHONONS
Phonon-dislocation interaction
[COO-1198-1281] N80-26128

Lattice dynamics with short-range correlations applied to two-phonon Raman scattering N80-26175

PHOSPHATES
The role of iron and calcium in the cycling of phosphates in shallow lakes N80-25722

PHOSPHIDES
Photoelectronic properties of zinc phosphide crystals, films and heterojunctions [SU-DSE-4042-T18] N80-25547

PHOSPHORUS
Evaluation of available phosphorus models — phosphorus loading in lakes N80-25729

PHOTOCHEMICAL OXIDANTS
Assessment of vertical distributions of photochemical pollutants and meteorological variables in the vicinity of urban areas [PB80-139918] N80-25933

PHOTOCHEMICAL REACTIONS
Development of a practical photochemical energy storage system. The norbornadiene-quadricyclene energy storage system [SRO-0893-17] N80-25889
Photochemical determinants of the efficiency of photogalvanic conversion of solar energy [COO-2989-5] N80-25886
Mechanisms of photochemical reactions in urban air [PB80-132384] N80-25939

PHOTOELECTROCHEMICAL DEVICES
The development of electrochemical photovoltaic cells [DSE-4042-T11] N80-25871

PHOTOGEOLOGY
Remote sensing applied to petroleum and mineral exploration. Citations from the International Aerospace Abstracts data base [NASA-CR-163311] N80-25770
Viking orbiter stereo imaging catalog [NASA-CR-3277] N80-26240

PHOTOGRAMMETRY
The combination of aerial and terrestrial photogrammetry in structural monitoring N80-25963

PHOTOGRAPHIC MEASUREMENT
A photographic study of drop formation heat and mass transfer N80-25581

PHOTOINTERPRETATION
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
Introduction to interpreting satellite imagery [INPE-1681-RPE/113] N80-25999

PHOTOIONIZATION
Two dimensional analysis of the photoionization chamber N80-26147

PHOTOLYSIS
Biological and synthetic systems for production of hydrogen from water — using hydrogenase with algae, chloroplasts, or synthetic catalysts [PB80-146269] N80-25480
Solar energy conversion through biophotolysis [SAN-0034-239-T1] N80-25852

PHOTOMETRY
Surface photometry of the Coma Cluster of galaxies N80-26223

PHOTOMICROGRAPHY
Evaluation of the stress corrosion cracking resistance of several high strength low alloy steels [NASA-TM-78276] N80-25413

PHOTONS
Collisional studies of ionization processes with heavy particle and photon [AD-A082640] N80-26126
Cross sections for electron and photon processes required by electron-transport calculations [SAND-79-0772] N80-26188

PHOTOVOLTAIC CELLS
Theory of thin-film photovoltaics. Non-ideal diode factors [DOE/ET-23103] N80-25840
Requirement definition and preliminary design of a photovoltaic central power station experimental test facility [SAND-79-7022-VOL-1] N80-25870
The development of electrochemical photovoltaic cells [DSE-4042-T11] N80-25871
Photovoltaic energy systems: Program summary [DOE/CS-0146] N80-25884

PHOTOVOLTAIC CONVERSION
Photovoltaic system costs using local labor and materials in developing countries [NASA-CR-163218] N80-25785
Solar photovoltaic flat panel applications experiment at the Oklahoma Center for Science and Arts [DOE/ET-23063/1] N80-25800
Novel solar cell concentrator photovoltaic converter system [SAND-79-7048] N80-25843
Novel concentrator photovoltaic converter system development [SAND-80-7004] N80-25912
The planar multijunction cell: A new solar cell for Earth and space [NASA-TM-81526] N80-26182

PHOTOVOLTAIC EFFECT
Photovoltaic mechanisms in polycrystalline thin film solar cells [DSE-3413-T2] N80-25853
Photovoltaic mechanisms in polycrystalline thin film solar cells [DSE-3413-T3] N80-25854
Theory of thin-film photovoltaics [DOE/ET-23103/4] N80-25895

PHYSICAL EXERCISE
The relationship of exercise performance to variations in blood acid-base status induced by changes in the inspired oxygen fraction N80-26030

PHYSIOLOGICAL EFFECTS
Various techniques for evaluating cardiodynamic function using chronically instrumented canine models [AD-A071264] N80-26035

PIEZOELECTRIC CRYSTALS
Electron-photon interactions in piezoelectric semiconductors for the phase insensitive detection of ultrasound N80-26113
Spectrum of acoustic waves excited in single and multiple layered crystalline media N80-26174

PILOT PERFORMANCE
Handling qualities of large flexible control-configured aircraft [NASA-CR-163206] N80-25344
Head-up transition behavior of pilots during simulated low-visibility approaches [NASA-TP-1618] N80-26039

PILOT PLANTS
EDS coal liquefaction process development, phase 4 [FE-2993-33] N80-25474

PINCH EFFECT
Nonlinear evolution of the magnetohydrodynamic sheet pinch N80-26148
Numerical simulation studies of toroidal pinches [COO-2456-57] N80-26163

PIPE FLOW
Numerical computations of friction and heat transfer in free swirling pipe flow N80-25570
Incompressible fluid flow in collapsible tubes N80-25575
Gas-particle flow in the entry region of a curved pipe [LBL-9905] N80-25627

PIPES (TUBES)
Explosively joining dissimilar metal tubes [AD-A082068] N80-25663
Computer program for elastic analysis of piping systems with special reference to the power piping code B31.1 [MT-135] N80-25697
Heating a fluid in full flow inside a horizontal cylindrical pipe using solar energy [INPE-1680-TDL/020] N80-25796
A theoretical and experimental investigation of the effects of the interaction between an acoustic field and cylindrical structure on sound transmission loss N80-26114

PITOT TUBES
Near-wall similarity in two- and three-dimensional turbulent boundary layers N80-25578

PLANAR STRUCTURES
The planar multijunction cell: A new solar cell for Earth and space [NASA-TM-81526] N80-26182

PLANE WAVES
Missile circumferential current density for plane wave electromagnetic field illumination [AD-A082763] N80-25526

PLANETARY WAVES
On the momentum transport by the stationary waves forced by the topography [INPE-1720-RPE/125] N80-25990

PLANKTON
Use of chlorophyll/Secchi Disk relationships — for predicting changes in water transparency due to varying plankton concentrations N80-25732
Variations in phytoplankton physiological parameters during transient nitrogen environments N80-26027

PLANTS (BOTANY)
Solar energy conversion through biophotolysis [SAN-0034-239-T1] N80-25852

PLASMA ACCELERATION
Prospects for generating 1-10 TPa pressures with a railgun [UCRL-82296-REV-2] N80-25841

PLASMA CONTROL
Two-dimensional equilibrium of field-reversed ion rings [INPE-1724-RPE/129-REV] N80-26153
Negative shear ferromak for stabilization of current disruptions in toroidal discharge [IPPJ-451] N80-26158
Magnetic confinement in plasmas in nuclear devices [UCRL-82785] N80-26185

PLASMA DENSITY
Stimulated Raman scattering from an underdense hydrogen plasma N80-26150

PLASMA DIAGNOSTICS
Optical mixing as a plasma diagnostic [LA-8262-MS] N80-26170

PLASMA FLUX MEASUREMENTS
Numerical simulation studies of toroidal pinches [COO-2456-57] N80-26163

PLASMA GENERATORS
A disc LaB6 cathode for plasma production in magnetic field [IPPJ-448] N80-26155

PLASMA HEATING
Charge exchange measurements of ion behavior in the ISX Tokamak N80-26149
Spectroscopic study of turbulent heating in the high beta Tokamak, Torus 2 [COO-2458-70] N80-26164

PLASMA INTERACTIONS
Nonlinear Alfven wave in an ultra-relativistic electron-positron plasma [IPPJ-449] N80-26156
Waves in an ultra-relativistic electron-positron plasma [IPPJ-450] N80-26157
Optical mixing as a plasma diagnostic [LA-8262-MS] N80-26170

PLASMA JETS
Prospects for generating 1-10 TPa pressures with a railgun [UCRL-82296-REV-2] N80-25841

PLASMA OSCILLATIONS
Effect of ion dynamics on relativistic nonlinear plasma oscillations [INPE-1704-RPE/122-REV] N80-26151

PLASMA PINCH
Axial laser heating of three meter theta pinch plasma [MSNW-79-1045-5] N80-26169

PLASMA SPRAYING
Materials Coating Techniques [AGARD-LS-106] N80-25499
Sprayed coatings N80-25503

PLASMA WAVES
Effect of ion dynamics on relativistic nonlinear plasma oscillations [INPE-1704-RPE/122-REV] N80-26151

PLASMA-PARTICLE INTERACTIONS
Effects of construction and operation of a satellite power system upon the magnetosphere — injection of orbit transfer vehicle exhaust [ATR-80(7824)-1] N80-25365

PLASMAS (PHYSICS)
Plasma aided techniques N80-25501
The plasma boundary layer and magnetopause layer of the Earth's magnetosphere N80-25959
Association between plasma bubble irregularities and airglow disturbances over Brazilian low latitudes [INPE-1748-RPE/141] N80-25972
New type of ray trajectory of thermal mode in an inhomogeneous magnetoplasma [IPPJ-447] N80-26154

Ion extraction from a plasma
[NASA-CR-159949] N80-26161
Contribution to the study of electrostatic and electromagnetic waves near the lower hybrid frequency in ionospheric plasma
[CRPE-NT-61] N80-26173
Synchrotron cooling and annihilation of an E(+)-E(-) plasma: The radiation mechanism for the March 5, 1979 transient
[NASA-TM-80674] N80-26229

PLASTIC DEFORMATION
Cyclic plastic deformation follower N80-25490

PLASTIC PROPERTIES
Linear-elastic and elastic-plastic fracture mechanics of structural materials
[DFVLR-FB-79-31] N80-25717

PLATE THEORY
Sudden stretching of a four layered composite plate
[NASA-CR-159870] N80-25383
Sudden bending of cracked laminates
[NASA-CR-159960] N80-25384

PLATING
Materials Coating Techniques
[AGARD-LS-108] N80-25499
High rate physical vapor deposition processes N80-25500

PLOTTING
Computer program documentation modified version of the JA70 aerodynamic heating computer program H800 (MINIVER with a DISSPLA plot package
[NASA-CR-160695] N80-26064

PLUMES
Modeling of buoyant plume dispersion in complex terrain
[PB80-145337] N80-25939

POLARIMETRY
Shock-induced grain alignment in the Orion Nebula N80-26222

POLARIZATION
Electrode polarization studies in hot corrosion systems
[COO-2980-4] N80-25433

POLARIZATION (SPIN ALIGNMENT)
Polarized LEED study of surface magnetism
[CONF-790909-15] N80-26187

POLARIZATION CHARACTERISTICS
An alternate algorithm for correction of the scanning multichannel microwave radiometer polarization radiances using Nimbus-7 observed data
[NASA-TM-80672] N80-25762

POLLUTION CONTROL
Combustion research
[LBL-9809] N80-25400
Evaluation of physical/chemical coal cleaning and flue gas desulfurization
[PB80-147822] N80-25481
Diesel exhaust emissions, volume 2. Citations from the NTIS data base
[PB80-805385] N80-25676
Diesel exhaust emission control for motor vehicles, volume 1. Citations from the Engineering Index data base
[PB80-805360] N80-25677
Diesel exhaust emission control for motor vehicles, volume 2. Citations from the Engineering Index data base
[PB80-805401] N80-25678
Dust control for a Borer-type continuous miner using a venturi scrubber on a transfer car
[PB80-144850] N80-25773
National Emissions Data System (NEDS), fuel use report
[PB80-146905] N80-25913
Flue gas desulfurization by the modified citrate process: Report of investigations
[PB80-134836] N80-25940
The use of pH and chloride electrodes for the automatic control of flue gas desulfurization systems
[PB80-138464] N80-25947
Guidance for lowest achievable emission rates from 19 major stationary sources of particulate, nitrogen oxides, sulfur dioxide, or volatile organic compounds
[PB80-140252] N80-25948
Compliance status of major air pollution facilities
[PB80-154580] N80-25952
Development of an automatic H2SO4 monitor — pollution control
[PB80-138191] N80-25957

POLLUTION MONITORING
Measurement and correlation of molecular metal pollutants in the air to existing weather conditions. Development of carbon atomizers for atomic absorption with high sensitivity and metal speciation capability N80-25913
Assessment of vertical distributions of photochemical pollutants and meteorological variables in the vicinity of urban areas
[PB80-139018] N80-25933
Pollutant measurements in plumes from power plants and cities - St. Louis area, July 1976. A project MISTT (midwest sulfur transformation and transport) report
[PB80-139058] N80-25935
Methods for analyzing inorganic compounds in particles emitted from stationary sources
[PB80-141781] N80-25936
Evaluation of stationary source particulate measurement methods. Volume 4: Basic oxygen furnaces
[PB80-141833] N80-25937
Transfer standards for the calibration of ambient air monitoring analyzers for ozone: Technical assistance document
[PB80-146871] N80-25941
Determination of the effects of ambient conditions on CFM56 aircraft engine emissions
[PB80-138597] N80-25944
Biogenic hydrocarbon contribution to the ambient air of selected areas - Tulsa; Great Smokey Mountains; Rio Blanco County, Colorado
[PB80-139066] N80-25945
Solid sorbent for collecting atmospheric sulfur dioxide
[PB80-131949] N80-25948
A rapid analysis of surface waters by high pressure liquid chromatography
[PB80-132681] N80-25949
Air quality data for metals, 1976, from the National Air Surveillance Networks
[PB80-147432] N80-25951
Measurement of perchloroethylene in ambient air
[PB80-144678] N80-25953
Cross-country urban and rural measurements of NOx and SO2
[PB80-137227] N80-25955
Development of an automatic H2SO4 monitor — pollution control
[PB80-138191] N80-25957
Particulate sampling and support. Executive summary
[PB80-149863] N80-25958

POLYCRYSTALS
Thin film polycrystalline silicon solar cells
[SAN-2207-3] N80-25844
Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T2] N80-25853
Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T3] N80-25854

POLYIMIDES
Development of polyimide materials for use in solar energy systems
[DOE/CS-35305/T1] N80-25855

POLYMER CHEMISTRY
Constitutive equations for polymers undergoing changes in microstructure with deformation N80-25443
Crystallization of ultra-quenched polymer glasses N80-25446
European Scientific notes, volume 34, no. 1
[AD-A081929] N80-26263

POLYMER MATRIX COMPOSITE MATERIALS
Fourier transform infrared investigation of the structure and moisture stability of the epoxy matrix in glass-reinforced composites N80-25378
Short beam shear tests of polymeric laminates and unidirectional composites
[NASA-CR-163239] N80-25381
Reinforced plastics: Fiberglass reinforcement, volume 2. Citations from the NTIS data base — with polymer matrices
[PB80-804743] N80-25451
Reinforced plastics: Boron, carbon, and other reinforcing materials, volume 3. Citations from the NTIS data base — polymer matrices
[PB80-804750] N80-25452

POLYMER PHYSICS
Interfacial tension theory for low molecular weight and polymer systems N80-25444

POLYMERIZATION
Bulk polymerization and stability of anaerobic adhesives
[MLM-2647] N80-25450

POLYURETHANE RESINS
Constitutive equations for polymers undergoing changes in microstructure with deformation N80-25443

PONDS
The prediction of solutions to management and engineering problems related to the eutrophication of bodies of water N80-25723

POPULATIONS
Hybrid clustering N80-26105

POROUS MATERIALS
Porous media flow problems: Natural convection and non-Newtonian N80-25579
Numerical modeling with a moving coordinate system: Application to flow through porous media — simulation of oil recovery processes N80-25580

POSITION (LOCATION)
Minimum performance standards: Emergency locator transmitters: Automatic Fixed-ELT (AF), Automatic Portable-ELT (AP), Automatic Deployable-ELT (AD) operating on 121.5 and 243.0 megahertz
[RTCA/DO-168] N80-25511
Comparison of ignition locations in a high swirl engine
[SAND-79-8715] N80-25670

POTASSIUM CHLORIDES
Short-pulse CO2-laser damage studies of NaCl and KCl windows
[LA-UR-80-108] N80-25849

POWDER METALLURGY
Tungsten and tungsten alloy powder metallurgy. Citations from the NTIS data base
[PB80-806011] N80-25434
Tungsten and tungsten alloy powder metallurgy. Citations from the Engineering Index data base
[PB80-806029] N80-25435
The use of mechanical alloying in the manufacture of multifilamentary superconductor wire N80-25536

POWDERED ALUMINUM
Investigation of the mechanical and corrosion properties of MA-87 aluminum powder alloy
[AD-A082457] N80-25418

POWER CONVERTERS
Requirement definition and preliminary design of a photovoltaic central power station experimental test facility
[SAND-79-7022-VOL-1] N80-25870

POWER PLANTS
Calculation of fluid circulation patterns in the vicinity of submerged jets using ORSMAC
[K/CSD-4] N80-25628

POWER SPECTRA
Characterization of Titan 3-D acoustic pressure spectra by least-squares fit to theoretical model
[AD-A083021] N80-25361

PRECIPITATION (METEOROLOGY)
Estimating long-term statistics for annual precipitation for six regions of the United States from tree-ring data
[UCRL-15162] N80-26005
The Precipitation Enhancement Project (PEP) — a report on the training workshop on weather modification for meteorologists held in Villadolid, Spain, March 1979
[DFVLR-MITT-79-12] N80-26006

PREDICTION ANALYSIS TECHNIQUES
Bayesian reliability theory for repairable equipment
[AD-A083009] N80-25884
The prediction of solutions to management and engineering problems related to the eutrophication of bodies of water N80-25723
Time series forecasting and prediction. Citations from the NTIS data base
[PB80-804396] N80-26107

PRESSURE
A calculation of the pressure dependent energy bands of CuCl
[INPE-1674-RPE/109] N80-26178

PRESSURE CHAMBERS
Design and construction of the Boyd-England high pressure apparatus
[NPL-CHEM-110] N80-25634

PRESSURE DISTRIBUTION
Pressure and temperature fields associated with aero-optics tests — transonic wind tunnel tests N80-25591
Measurement of weak shock-wave profiles [SAND-79-8004] N80-25617
PRESSURE EFFECTS
Collapse of experimental capsules under external pressure [PNL-3165] N80-25705
PRESSURE GRADIENTS
The application of inverse methods to problems in ocean circulation [PB80-149651] N80-26028
PRESSURE MEASUREMENTS
Measurement of weak shock-wave profiles [SAND-79-8004] N80-25617
PRESSURE VESSELS
Design and construction of the Boyd-England high pressure apparatus [NPL-CHEM-110] N80-25634
Fatigue of weldments in nuclear pressure vessels and piping [NUREG-CR-1351] N80-25706
PROBABILITY DENSITY FUNCTIONS
Probability modeling and estimation for hourly variation of air pollution concentrations. Study on statistics and environmental factors in health (SIMS) [DOE/EY-22874/66] N80-25924
Joint Gaussian probability plot program [UCID-18513] N80-26106
PROBABILITY DISTRIBUTION FUNCTIONS
On problems of estimation for two parameter decreasing failure rate distributions applied to reliability [AD-A082991] N80-25682
An adaptive Bayesian scheme for estimating reliability growth under exponential failure times [AD-A083006] N80-25683
PROBLEM SOLVING
A coordinate transformation method for solving a convection phase change problem N80-25572
Optimal linear estimation applied to generate suboptimal numerical solutions for control problems [INPE-1731-RPE/131] N80-26084
A proposed solution to the Behrens-Fisher problem N80-26104
PROCESS CONTROL (INDUSTRY)
Advances in materials science [UCRL-50058-79-3] N80-25376
Thermo-mechanical process for treatment of welds [CONF-800316-2] N80-25423
Liquid fuels production from biomass, no. 7 [COO-4388-7] N80-25462
Preparation of a coal conversion systems technical data book [FE-2286-44] N80-25472
Research and development of an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels [FE-1800-42] N80-25473
EDS coal liquefaction process development, phase 4. EDS commercial plant study design update, offsite design basis: Illinois coal market flexibility sensitivity case [FE-2893-37] N80-25475
Test and evaluate the TRI-GAS low Btu coal gasification process [FE-2798-74] N80-25476
Synthetic fuels: Methane, volume 1. Citations from the Engineering Index data base [PB80-805245] N80-25478
Synthetic fuels: Methane, volume 2. Citations from the Engineering Index data base [PB80-805252] N80-25479
The use of mechanical alloying in the manufacture of multifilamentary superconductor wire N80-25536
Semiconductor development laboratory computer control software [SAND-79-1709] N80-26078
PROCUREMENT POLICY
Recommendations on policies and procedures for off-the-shelf electronic test equipment acquisition and support [RTCA-307-79/SC134-69] N80-25535
PRODUCT DEVELOPMENT
Synthetic fuels: Methane, volume 1. Citations from the Engineering Index data base [PB80-805245] N80-25478
Synthetic fuels: Methane, volume 2. Citations from the Engineering Index data base [PB80-805252] N80-25479
Investigation of reliability attributes and accelerated stress factors on terrestrial solar cells [NASA-CR-163209] N80-25781
Novel solar cell concentrator photovoltaic converter system [SAND-79-7048] N80-25843
Thin film polycrystalline silicon solar cells [SAN-2207-3] N80-25844
High-temperature fuel cell research and development [SAN-1485-T1] N80-25846
Fuel cell research on second-generation molten-carbonate systems [SAN-11276-1] N80-25847
Development of a second-generation concentrating tracking solar collector [ASE-4480] N80-25851
Development of polyimide materials for use in solar energy systems [DOE/CS-35305/T1] N80-25855
The development of electrochemical photovoltaic cells [DSE-4042-T11] N80-25871
Preliminary development of the Band Type Variable Inertia Flywheel (BVIF) [SAND-79-7089] N80-25879
Optimization of solar assisted heat pump systems via a simple analytic approach [BNL-27316] N80-25896
Novel concentrator photovoltaic converter system development [SAND-80-7004] N80-25912
PRODUCTION ENGINEERING
Analysis and evaluation in the production process and equipment area of the low-cost solar array project [NASA-CR-163206] N80-25782
Amorphous silicon solar cells by hydrogen implantation [SAN-3042-1] N80-25842
Use of thin glass reflectors for solar concentrators [SAND-80-0109C] N80-25857
Cost estimating relationships for airframes in the development and production phases [NASA-TM-80229] N80-26198
PRODUCTIVITY
Phytoplankton primary production below Arctic Ocean pack ice: An ecosystems analysis N80-26026
PROGRAM VERIFICATION (COMPUTERS)
Development and verification of a model for predicting eutrophication trends in Czechoslovakia N80-25726
PROGRAMMING
Sequential control structure abstractions for programming languages N80-26049
PROGRAMMING LANGUAGES
The induction of the syntax of natural language by computer N80-26050
A language for simulating dynamic hierarchical systems [INPE-1728-TDL/024] N80-26061
Military standard, JOVIAL (J73) [AD-A081927] N80-26068
PROJECT MANAGEMENT
A decision by the Secretary of Defense is needed on the AV-8B aircraft program [PB80-143209] N80-25291
F/A-18 naval strike fighter: Its effectiveness is uncertain [PB80-143225] N80-25324
PROJECTILES
Windtunnel tests of a tubular supersonic inlet for projectiles [DFVLR-FB-79-26] N80-25367
PROPELLANT DECOMPOSITION
Nitramine monopropellant deflagration and general nonsteady reacting rocket chamber flows N80-25373
PROPELLANT GRAINS
Model of burning and detonation in rocket motors [LA-8141-MS] N80-25374
PROPELLANTS
Mammalian toxicological evaluation of TNT wastewaters. Volume 2: Acute and subacute mammalian toxicity of TNT and LAP mixture [AD-A080957] N80-26034
PROPULSION
Exploratory studies of the cruise performance of upper surface blown configurations. Experimental program: Test facilities, model design instrumentation, and lowspeed, high-lift tests [NASA-CR-3192] N80-25297
PROPULSION SYSTEM CONFIGURATIONS
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies — various hybrid/electric power train configurations and electrical and mechanical drive-line components [NASA-CR-163227] N80-26203
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies [NASA-CR-163228] N80-26204
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings [NASA-CR-163229] N80-26205
Near-term hybrid vehicle program, phase 1 [NASA-CR-163230] N80-26206
Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report [NASA-CR-163231] N80-26207
Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package [NASA-CR-163232] N80-26208
PROPULSION SYSTEM PERFORMANCE
Engine component improvement: Performance improvement, JT8D-7 3.9 AR fan [NASA-CR-159806] N80-25232
PROTECTIVE COATINGS
Failure analysis of ceramic-to-metal seals [BDX-613-2414] N80-25449
Materials Coating Techniques [AGARD-LS-106] N80-25499
Sprayed coatings N80-25503
Overlay coatings for gas turbine airfoils N80-25506
Applications of sprayed coatings N80-25507
Wear resistant coatings made by chemical vapour deposition N80-25508
Applications of physical vapor deposition processes N80-25529
PSYCHOMETRICS
Computerized adaptive performance evaluation [AD-A082845] N80-26085
PUBLIC HEALTH
Risk of renewable energy sources: A critique of the Inhaber report [ERG-79-3] N80-25892
PULSE COMMUNICATION
Digital signal processing with an adaptive delay element N80-25537
PULSE GENERATORS
Nanosecond pulsers for MM wave tubes [AD-A080990] N80-25541
Nanosecond pulsers for MM wave tubes [AD-A080988] N80-25542
PYROLYSIS
Critical studies of the rapid pyrolysis and hydropyrolysis of coal [FE-MIT-2295T26-9] N80-25459
Flash hydropyrolysis of coal [BNL-51052] N80-25468
Environmental control technology for biomass flash pyrolysis [CONF-800129-2] N80-25477
Problems and opportunities for solar energy in biomass, pyrolysis, and gasification [SERI/TP-332-495] N80-25810

Q

Q SWITCHED LASERS
High repetition rate electro-optic Q-switching of Nd(3+):YAG lasers showing strong optical birefringence [IPF-79-6] N80-25656
QUADRATIC EQUATIONS
Inequalities for joint distribution of quadratic forms [AD-A083033] N80-26090
QUADRUPOLES
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere [AD-A083019] N80-25877

Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083022] N80-25978

QUALITY CONTROL
Software quality assurance: One of the software acquisition engineering guidebook series
[AD-A082425] N80-26070

QUANTITATIVE ANALYSIS
Chemical ionization mass spectrometry
[AD-A081249] N80-25394

QUANTUM CHROMODYNAMICS
Some aspects of the Quark-Parton model in the weak and the strong interaction phenomenology
N80-26117

QUANTUM ELECTRODYNAMICS
Renormalizing the strong-coupling expansion for quantum field theory: Present status
[LA-UR-80-482] N80-26191

QUANTUM MECHANICS
Study of nonlinear waves described by the cubic Schroedinger equation
[UCRL-52920] N80-25530

QUARKS
Some aspects of the Quark-Parton model in the weak and the strong interaction phenomenology
N80-26117

QUARTZ CRYSTALS
Research of an optimal configuration for high stability quartz oscillators on board aircraft and missiles
N80-26258

QUASARS
On the physical environment in galactic nuclei
N80-26234

QUENCHING (COOLING)
Crystallization of ultra-quenched polymer glasses
N80-25446

QUEUEING THEORY
Some queuing network models of computer systems
[NASA-CR-160893] N80-26082

R

RADAR
Radar Microwave Link (RML) electromagnetic compatibility measurements
[AD-A083072] N80-25523

RADAR ATTENUATION
Rain rate range profiling from a spaceborne radar
[NASA-TM-80656] N80-25989

RADAR HOMING MISSILES
A simple graphical model for analyzing radar homing interceptor engagements
[AD-A082460] N80-25528

RADAR TRACKING
Flight evaluation of a radar cursor technique
[AD-A083027] N80-25519

RADIAL FLOW
Analytical and experimental investigation of flow between a smooth stationary disc and a grooved rotating disc
N80-25584

RADIANCE
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta
[E80-10152] N80-25734

RADIANT FLUX DENSITY
Unsteady density and velocity measurements in the 6 foot x 6 foot wind tunnel
N80-25594

RADIATION EFFECTS
Radiation effects on organic insulators for superconducting magnets
[ORNL/TM-7077] N80-25551
Preliminary environmental assessment for the Satellite Power System (SPS), revision 1. Volume 1: Executive summary
[DOE/ER-0036/1] N80-25874

RADIATION SHIELDING
Microwave surface impedance studies on copper at low temperature
N80-25407

RADIATION SOURCES
Elastic-wave radiation from spherical sources --- Seismic radiation source
[UCRL-52867] N80-25529
Synchrotron cooling and annihilation of an E(+)-E(-) plasma: The radiation mechanism for the March 5, 1979 transient
[NASA-TM-80674] N80-26229

RADIATIVE HEAT TRANSFER
Laminar and turbulent flow solutions with radiation and ablation injection for Jovian entry --- radiative heating rates for the Galileo probe
[NASA-CR-163215] N80-26238

RADIATIVE LIFETIME
Radiative and nonradiative recombination times in semiconducting films
[INPE-1679-RPE/111Z] N80-26179

RADIATIVE RECOMBINATION
Radiative and nonradiative recombination times in semiconducting films
[INPE-1679-RPE/111Z] N80-26179

RADIO ALTIMETERS
GEOS-3 radar altimeter study for the South Atlantic Bight
[NASA-TM-73286] N80-26023

RADIO ASTRONOMY
Observations of electron gyroharmonic waves and the structure of the Io torus --- Jupiter 1 spacecraft radio astronomy experiment
[NASA-TM-80696] N80-26231
Is the remnant of SN1006 crab-like?
[NASA-TM-80689] N80-26251

RADIO COMMUNICATION
VHF air-ground technology and spectrum utilization
[RTCA-155-79/SC140-17-REV] N80-25513
Audio systems characteristics and minimum performance standards. Aircraft microphones (except carbon), aircraft headsets and speakers and aircraft audio selector panels and amplifiers
[RTCA-305-79/SC132-54-REV-2] N80-25514

RADIO EMISSION
Milliarcsecond structure of nine compact extragalactic sources at 1671 MHz N80-26233

RADIO SPECTRA
Milliarcsecond structure of nine compact extragalactic sources at 1671 MHz N80-26233

RADIO TRANSMISSION
NBS time and frequency dissemination services
[PB80-147747] N80-25494

RADIOACTIVE ISOTOPES
User's manual for biosphere and dose simulation program (BIODOSE)
[UCRL-15186] N80-26037

RADIOACTIVE WASTES
Research and development activities: High-level waste immobilization program
[PNL-3050-1] N80-26131
Development and characterization of solidified forms for high level wastes
[PNL-3060] N80-26132
Geoscience data base handbook for modeling a nuclear waste repository, volume 1 --- salt bed and dome repositories
[NUREG-CR-0912-VOL-1] N80-26133
Nuclear waste management: A perspective
[CONF-800117-1] N80-26135

RADIOACTIVITY
Determination of primordial and cosmogenic radioactivity in achondritic meteorites by low-level, gamma-ray spectrometry
[DOE/TIC-11096] N80-26241

RAIL TRANSPORTATION
Application of computer and interactive graphics --- highway and railroad traffic flow
[PB80-147051] N80-26079
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-138472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-138480] N80-26218

RAIN
Rain rate range profiling from a spaceborne radar
[NASA-TM-80656] N80-25989

RAMAN SPECTRA
Stimulated Raman scattering from an underdense hydrogen plasma N80-26150
Lattice dynamics with short-range correlations applied to two-phonon Raman scattering
N80-26175

RAMAN SPECTROSCOPY
Resonance Raman spectroscopy of adsorbed species at solid-gas interfaces N80-25386

RANDOM NOISE
Non-Gaussian characteristics of the FDM-FM satellite baseband voice channel N80-25518

RANDOM VARIABLES
Confidence interval robustness of correlation coefficient N80-26101

RAPID TRANSIT SYSTEMS
Impact of advanced group rapid transit technology
[PB80-153323] N80-26219

RARE GASES
Theoretical equations of state for the rare gases
[LA-8062] N80-25396
Lattice dynamics with short-range correlations applied to two-phonon Raman scattering
N80-26175

RAY TRACING
New type of ray trajectory of thermal mode in an inhomogeneous magnetoplasma
[IPPJ-447] N80-26154

RAYLEIGH WAVES
Energy dissipation of Rayleigh waves due to absorption along the path of the use of finite-element method N80-25961

RDX
Mammalian toxicological evaluation of TNT wastewaters. Volume 2: Acute and subacute mammalian toxicity of TNT and LAP mixture
[AD-A080957] N80-26034

REACTION KINETICS
Reaction rate self-oscillations during the oxidation of hydrogen over nickel N80-25390
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432
The role of iron and calcium in the cycling of phosphates in shallow lakes N80-25722
Homogeneous production and removal of NOx from combustion exhaust gases --- reaction rate over a temperature range
[ARI-RP-49] N80-25925

REACTOR MATERIALS
Thermophysical properties of sodium --- liquid metal fast breeder reactors
[ANL/CEN/RSD-79-1] N80-25402
Hot cell measuring and test equipment calibration control
[CONF-791103-73] N80-25842

REACTOR TECHNOLOGY
Alloy development for irradiation performance in fusion reactors
[COO-5098] N80-25426

REAL TIME OPERATION
LANAC: A high level language for data acquisition and process control by minicomputers
[INPE-1721-RPE/126] N80-26063

RECEIVERS
Communication satellite technology: State of the art and development opportunities
[NASA-CR-159977] N80-25358

RECONSTRUCTION
The reconstruction of flight paths from AIDS-data with the aid of modern filtering methods N80-25288

RECRYSTALLIZATION
A presentation for the deformation of a metal including the effects of strain hardening and recrystallization N80-25408

RECTANGULAR PLATES
Dynamic responses of a multi-layered rectangular plate on viscoelastic foundation due to moving loads
N80-25688

REDUCED GRAVITY
F-104 low-gravity calibration tests for materials processing in space precursory experiments
[NASA-TM-78278] N80-25355

REDUCTION (CHEMISTRY)
Oxygen reduction on a graphite paste and a catalyst loaded graphite paste electrode
[IS-T-866] N80-25898

REDUNDANCY ENCODING
Inherent error in asynchronous digital flight controls
[AD-A082622] N80-25346

REENTRY TRAJECTORIES
MCC level C formulation requirements. Entry guidance and entry autopilot, optional TAEM targeting
[NASA-TM-81072] N80-25369

REFLECTANCE
Silver deterioration in second surface solar mirrors
[SAND-79-8276] N80-25856

REFLECTORS
Comparative method for the evaluation of array reflector materials
[ORNL/CSD-42] N80-25877

REFRACTION
Effect of nonlinear refraction on beam brightness in laser fusion applications
[LA-UR-80-417] N80-25655

REFRACTORY MATERIALS
Techniques of chemical vapor deposition N80-25502

REFRIGERATING
Magnetic refrigeration for space applications: Report on a design study
[LA-8134] N80-25492

REGENERATION (ENGINEERING)
An open cycle turbine solar thermal power system N80-26257

REGRESSION ANALYSIS
Advanced image compression study
[AD-A082014] N80-25637
Use of chlorophyll/Secchi Disk relationships — for predicting changes in water transparency due to varying plankton concentrations N80-25732

REINFORCED PLASTICS
Reinforced plastics: Boron, carbon, and other reinforcing materials, volume 3. Citations from the NTIS data base — polymer matrices
[PB80-804750] N80-25452

REINFORCEMENT (STRUCTURES)
A study of the reinforcement required for cutouts in aircraft semi-monocoque structure N80-25317
Phenomenological study on reinforcement of elastomers N80-25447
Reinforced plastics: Fiberglass reinforcement, volume 2. Citations from the NTIS data base — with polymer matrices
[PB80-804743] N80-25451
A review of fabric usage in pavements constructed on low-strength soils
[AD-A083076] N80-25484

REINFORCEMENT RINGS
Vibration of cylindrical shells, with and without ring stiffening
[AD-A082524] N80-25701

REINFORCING FIBERS
Reinforced plastics: Fiberglass reinforcement, volume 2. Citations from the NTIS data base — with polymer matrices
[PB80-804743] N80-25451

RELATIVISTIC PLASMAS
Effect of ion dynamics on relativistic nonlinear plasma oscillations
[INPE-1704-RPE/122-REV] N80-26151
Relativistic nonlinear cyclotron waves in a hot electron-ion plasma
[INPE-1723-RPE/128-REV] N80-26152
Nonlinear Alfven wave in an ultra-relativistic electron-positron plasma
[IPPJ-449] N80-26156
Waves in an ultra-relativistic electron-positron plasma
[IPPJ-450] N80-26157

RELATIVISTIC THEORY
Studies in relativistic many-body perturbation theory for atomic systems: Hyperfine properties and forbidden optical transitions N80-26118
Relativistic many body perturbation theory: Application to spin-Hamiltonian parameters of atoms and ions with half-filled shells N80-26119

RELATIVISTIC VELOCITY
Feasibility studies for light scattering experiments to determine the velocity relaxation of small particles in a fluid
[NASA-CR-163214] N80-25586

RELATIVITY
Mathematical methods in physics: Tensor analysis 3 — geodesy, Einstein's gravitational law, and the relativistic form of Maxwell equations
[INPE-1648-RPE/102-REV] N80-26088
Relativity theory. Citations from the NTIS data base
[PB80-805542] N80-26192

RELAXATION METHOD (MATHEMATICS)
Steady state Boltzmann equation solution by numerical relaxation
[DOE/ET-15422/T3] N80-26095

RELAXATION OSCILLATORS
Synchronization of weakly coupled relaxation oscillators — starting with Mishchenko's theorem
[MC-TW-180/78] N80-26098

RELIABILITY
On problems of estimation for two parameter decreasing failure rate distributions applied to reliability
[AD-A082991] N80-25682
An adaptive Bayesian scheme for estimating reliability growth under exponential failure times
[AD-A083006] N80-25683

RELIABILITY ANALYSIS
Bayesian reliability theory for repairable equipment
[AD-A083009] N80-25684
Evaluation of reliability of operational solar-energy systems
[CONF-791105-2] N80-25872

RELIABILITY ENGINEERING
F/A-18 naval strike fighter: Its effectiveness is uncertain
[PB80-143225] N80-25324
Environmental conditions and test procedures for airborne equipment
[RTCA-309-79/SC135-41] N80-25329
Application of reliability, maintainability, and availability engineering to solar heating and cooling systems
[CONF-800103-3] N80-25687
Reliability of structural systems N80-25690
Investigation of reliability attributes and accelerated stress factors on terrestrial solar cells
[NASA-CR-163209] N80-25781
Reliability and maintainability evaluation of solar collector and manifold interconnections
[SOLAR/0902-79/70] N80-25866

REMOTE SENSORS
Remote electromagnetic sensing of underground coal burns
[FE-2414-8] N80-25767
Remote sensing applied to petroleum and mineral exploration. Citations from the International Aerospace Abstracts data base
[NASA-CR-163311] N80-25770
Instrumentation and data processing used in Earth Resources Technology Satellites (ERTS), volume 2. Citations from the NTIS data base
[PB80-805740] N80-25771
GEOS-3 radar altimeter study for the South Atlantic Bight
[NASA-TM-73286] N80-26023
Arc program documentation
[NASA-CR-156867] N80-26054

REPLENISHMENT
Cost-effectiveness measures of replenishment strategies for systems of orbital spacecraft
[AD-A081859] N80-25356

RESEARCH
Journal of research of the National Bureau of Standards, volume 85, no. 1 — aqueous electrolytes, iridium-192 gamma ray sources, air density at differing altitude, and isotopic abundance of thallium
[PB80-146566] N80-25377
Schottky Barrier devices. Citations from the NTIS data base
[PB80-804776] N80-25557

RESEARCH AND DEVELOPMENT
Transistor amplifiers, volume 2. Citations from the NTIS data base
[PB80-806037] N80-25566
Technical publications of the NASA-Wallops Flight Center, 1973 - 1979
[NASA-TM-73285] N80-26193

RESEARCH MANAGEMENT
Unfulfilled technology needs in space power systems
[NASA-TM-80677] N80-25789

RESERVOIRS
Hydrological and ecological models of shallow lakes and reservoirs
[IIASA-CP-78-14] N80-25720
Discussion of questions related to hydrophysical and ecological modeling of shallow lakes and reservoirs N80-25721
Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749

RESIDENTIAL AREAS
Data handbook for the national solar energy demonstration book
[DSE-5216-T4] N80-25873
International analysis of residential energy use and conservation
[LBL-9283] N80-25881
Heat-pump-centered integrated community energy systems: Systems development, Consolidated Natural Gas Service Company
[ANL/CNSV/TM-29] N80-25890
Solar-assisted heat pump-swimming pool synergistics for domestic heating
[UCRL-83456] N80-25905

RESIDUAL STRESS
Residual stress factors in torsional failure modes of induction-hardened steel axle shafts N80-25689
Measured residual stresses in type 304 stainless steel piping butt weldments
[DOE/TIC-11126] N80-25712

RESISTANCE HEATING
Performance prediction of power augmented electrothermal hydrazine thrusters
[TUM-LRT-KB-78/1] N80-25375

RESOLUTION
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759

RESONANCE
Resonance Raman spectroscopy of adsorbed species at solid-gas interfaces N80-25386

RESONATORS
Eigenvalues for unstable resonators with slightly misaligned strip mirrors
[INPE-1738-RPE/137-REV] N80-26140

RESOURCES MANAGEMENT
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
Economic baselines for current underground coal mining technology
[NASA-CR-163259] N80-25764
Beneficial use of rejected heat from electric power plants
[COO-4531-9] N80-25841

REVISIONS
Synthesized structured programming
[AD-A082359] N80-26074

RHODIUM
Chemisorption and reactivity studies of small molecules on rhodium surfaces
[LBL-9471] N80-26186

RIGID STRUCTURES
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163206] N80-25344

RING STRUCTURES
In-depth analysis of conformational changes in small ring molecules N80-26122

RIO GRANDE (NORTH AMERICA)
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejos and South Fork River basins N80-25752

RIVER BASINS
Geologic application of thermal-inertia mapping from satellite — Powder River Basin, Wyoming and Cabeza Prieta Arizona
[E80-10151] N80-25733
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750

LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejobs and South Fork River basins N80-25752
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus and Walker River Basins N80-25758
A hydrometeorological model for medium sized hydrographic basins [INPE-1729-TDL/025] N80-25987

RIVERS
Theoretical investigations into the development of an intensively used shallow lake with a river flowing into it N80-25730
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejobs and South Fork River basins N80-25752
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753
Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758

ROBOTS
Technology assessment: The impact of robots [PB80-142268] N80-26041

ROCKET ENGINE CASES
Model of burning and detonation in rocket motors [LA-8141-MS] N80-25374

ROCKET EXHAUST
Characterization of Titan 3-D acoustic pressure spectra by least-squares fit to theoretical model [AD-A083021] N80-25361
Proceedings of the workshop on Stratospheric and Mesospheric Impacts of Satellite Power Systems (SPS) [CONF-7808197] N80-25363
Effects of rocket exhaust products in the thermosphere and ionosphere [LA-8233-MS] N80-25922

ROCKET LAUNCHING
Characterization of Titan 3-D acoustic pressure spectra by least-squares fit to theoretical model [AD-A083021] N80-25361
The 1930SB MLRS, missile no. 1125, round no. V-98, 11 December 1979 [AD-A082969] N80-26000

ROCKET-BORNE INSTRUMENTS
Rocket measuremnts of electron temperature in the E region [NASA-CR-163210] N80-25954
Rocket observations of solar radiation during the eclipse of 26 February 1979 [NASA-CR-163211] N80-26242

ROCKY MOUNTAINS (NORTH AMERICA)
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755

ROLLER BEARINGS
Rotor-bearing dynamics technology design guide. Part 4: Cylindrical roller bearings [AD-A082355] N80-25662

ROOFS
Development of lightweight mine roof supports [PB80-143936] N80-25774

ROOM TEMPERATURE
The rate (time)-dependent behavior of Ti-7Al-2Cb-1Ta titanium alloy at room temperature under quasistatic monotonic and cyclic loading [AD-A082623] N80-25416

ROTARY WINGS
Sensor for measuring instantaneous angle of attack of helicopter blades [NASA-CR-3297] N80-25330

ROTOR AERODYNAMICS
Development and validation of a combined rotor fuselage induced flow field computational method — Langley V/STOL tunnel [NASA-TP-1656] N80-25296

ROTORS
Rotor-bearing dynamics technology design guide. Part 4: Cylindrical roller bearings [AD-A082355] N80-25662
Evaluation of new materials for rotor hub journal bearings — self lubricating materials [AD-A082444] N80-25665

RUNWAY CONDITIONS
Aircraft dynamic response to damaged runways [AGARD-R-685] N80-25325
Runway surface roughness N80-25326
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327
Parameters affecting aircraft performance on runways in bad condition N80-25328

RUNWAYS
Aircraft dynamic response to damaged runways [AGARD-R-685] N80-25325
Runway surface roughness N80-25326
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327

S

SACRAMENTO VALLEY (CA)
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California [E80-10163] N80-25738
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753

SAFETY
Funding for highway safety research, development, and demonstration in the National Highway Traffic Safety Administration [PB80-137672] N80-26200

SAFETY FACTORS
Comparative method for the evaluation of array reflector materials [ORNL/CSD-42] N80-25877

SALINITY
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta [E80-10152] N80-25734

SALT BEDS
Geoscience data base handbook for modeling a nuclear waste repository, volume 1 — salt bed and dome repositories [NUREG-CR-0912-VOL-1] N80-26133

SAMPLERS
Solid sorbent for collecting atmospheric sulfur dioxide [PB80-131949] N80-25946

SAN FRANCISCO BAY (CA)
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta [E80-10152] N80-25734

SAN JOAQUIN VALLEY (CA)
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753

SANDSTONES
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California [E80-10163] N80-25738

SANDWICH STRUCTURES
Buckling of sandwich panels subjected to axial compression, shear forces and lateral pressures. Part 2: Analysis [SAAB-TN-AE-72-BT-2] N80-25895

SATELLITE DRAG
Data generator for a satellite-borne three-axis accelerometer [AD-A082827] N80-25638

SATELLITE OBSERVATION
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
New goals for snow monitoring by satellite N80-25745
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
Application of satellite data for snow mapping in Norway N80-25748
Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
Applications of remote sensing to emergency management [AD-A082243] N80-25765

SATELLITE POWER TRANSMISSION (TO EARTH)
The solar power satellite concepts: The past decade and the next decade [NASA-TM-81000] N80-25360
Proceedings of the workshop on Stratospheric and Mesospheric Impacts of Satellite Power Systems (SPS) [CONF-7809197] N80-25363
Preliminary materials assessment for the Satellite Power System (SPS) [DOE/ER-0038] N80-25364
Proceedings of the Workshop on Meteorological Effects of Satellite Power System Rectenna Operation and Related Microwave Transmission Problems [CONF-7808114] N80-26004

SATELLITE SOLAR ENERGY CONVERSION
The solar power satellite concepts: The past decade and the next decade [NASA-TM-81000] N80-25360

SATELLITE SOLAR POWER STATIONS
The solar power satellite concepts: The past decade and the next decade [NASA-TM-81000] N80-25360

SATELLITE TRACKING
Geometry of Orbiting Earth Satellites (GOES) [AD-A082381] N80-25362

SATELLITE TRANSMISSION
Study of advanced communications satellite systems based on SS-FDMA [NASA-CR-159778] N80-25357
Data extraction and calibration of TIROS-N/NOAA radiometers [PB80-150824] N80-25772

SATELLITE-BORNE INSTRUMENTS
BIRAMIS: Direct measurement of the Earth radiation budget by means of an accelerometer in space N80-26256

SATELLITE-BORNE PHOTOGRAPHY
U.S. geological survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft, Sequoia, Kings, Canyon National Park, California. Project no. 6: Conservation of natural areas and of the genetic material they contain [PB80-147291] N80-25775
Environmental satellite imagery [PB80-153356] N80-26015

SATELLITE-BORNE RADAR
Rain rate range profiling from a spaceborne radar [NASA-TM-80656] N80-25989

SATELLITES
The electrostatic potential of an equatorial satellite [INPE-1749-RPE/142-REV] N80-25359

SCATTERING CROSS SECTIONS
Cross sections for electron and photon processes required by electron-transport calculations [SAND-79-0772] N80-26188

SCENE ANALYSIS
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment
[E80-10160] N80-25736
SCHOTTKY DIODES
Schottky Barrier devices. Citations from the NTIS data base
[PB80-804776] N80-25557
Schottky barrier devices, volume 4. Citations from the Engineering Index data base
[PB80-804784] N80-25558
Schottky barrier devices, volume 5. Citations from the Engineering Index data base
[PB80-804792] N80-25559
SCHROEDINGER EQUATION
Study of non linear waves described by the cubic Schroedinger equation
[UCRL-52920] N80-25530
SCIENTISTS
Technical manual for engineers and scientists
[PB80-143266] N80-25486
SCRUBBERS
Dust control for a Borer-type continuous miner using a venturi scrubber on a transfer car
[PB80-144853] N80-25773
SEA ICE
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
SEA TRUTH
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
SEA WATER
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763
SEARCH PROFILES
Applications of a reconfigurable array of flexible processors in intelligence information retrieval
[AD-A082324] N80-26195
SEARCHING
A direct search procedure using linear programming to generate numerical suboptimal solutions in control problems
[INPE-1725-RPE/130] N80-26062
Browsing in large data bases
[AD-A081987] N80-26194
SEDIMENT TRANSPORT
The modeling of aquatic ecosystems of shallow lakes exchanging matter with sediment and with neigboring bodies of water N80-25725
The modeling of nutrient exchange between sediment and water N80-25727
SEDIMENTS
Geological and geotechnical investigation of sediment redistribution on the central equatorial Pacific seafloor N80-26021
SEISMIC ENERGY
Seismic engineering program
[PB80-149909] N80-25964
SEISMIC WAVES
Elastic-wave radiation from spherical sources — Seismic radiation source
[UCRL-52867] N80-25529
SEISMOGRAPHS
Analysis of tentative seismic design provisions for buildings
[PB80-129182] N80-25496
SEISMOLOGY
NASA geodynamics program
[NASA-TM-81978] N80-25966
Seismic engineering program
[PB80-149909] N80-25964
SELENIDES
Selenide Isotope Generator for the Galileo mission. Heat pipe attachment technology
[TES-33009-45] N80-25832
Selenide isotope generator for the Galileo mission. GIG/Galileo hermetic receptacle test program
[TES-33009-47] N80-25833
Selenide isotope generator for the Galileo mission. SIG thermal insulation tests evaluation
[TES-33009-50] N80-25834
Selenide isotope generator for the Galileo mission. SIG hermetic bimetal weld transition joint
[TES-33009-51] N80-25835
SELF LUBRICATING MATERIALS
Evaluation of new materials for rotor hub journal bearings — self lubricating materials
[AD-A082444] N80-25665
SELF OSCILLATION
Reaction rate self-oscillations during the oxidation of hydrogen over nickel N80-25390
SEMICONDUCTING FILMS
Radiative and nonradiative recombination times in semiconducting films
[INPE-1679-RPE/112] N80-26179
SEMICONDUCTOR DEVICES
Electron beam semiconductor devices. Citations from the NTIS data base
[PB80-805997] N80-25555
Electron beam semiconductor devices. Citations from the Engineering Index data base
[PB80-806003] N80-25556
Schottky barrier devices, volume 4. Citations from the Engineering Index data base
[PB80-804784] N80-25558
Schottky barrier devices, volume 5. Citations from the Engineering Index data base
[PB80-804792] N80-25559
Semiconductor measurement technology: Accurate linewidth measurements on integrated-circuit photomasks
[PB80-148216] N80-25564
Semiconductor measurement technology: Comprehensive test pattern and approach for characterizing SOS technology
[PB80-147952] N80-25565
Semiconductor development laboratory computer control software
[SAND-79-1709] N80-26078
SEMICONDUCTOR DIODES
Theory of thin-film photovoltaics. Non-ideal diode factors
[DOE/ET-23103] N80-25840
SEMICONDUCTOR JUNCTIONS
Photoelectronic properties of zinc phosphide crystals, films and heterojunctions
[SU-DSE-4042-T18] N80-25547
The planar multijunction cell: A new solar cell for Earth and space
[NASA-TM-81526] N80-26182
SEMICONDUCTORS (MATERIALS)
Photoacoustic detection methods for characterizing laser irradiation and recrystallization of semiconductors
[ISM-262] N80-25552
Electron-photon interactions in piezoelectric semiconductors for the phase insensitive detection of ultrasound N80-26113
Roles of the lower and upper Hubbard bands and the donor-excitonic states in the theory of shallow impurity states in doped semiconductors
[INPE-1684-RPE/115] N80-26180
SEQUENTIAL CONTROL
Sequential control structure abstractions for programming languages N80-26049
SERVICE LIFE
Performance deterioration based on in-service engine data: JT9D jet engine diagnostics program
[NASA-CR-159525] N80-25340
The testing and application of machinability criteria
[CSIR-TRANS-1457] N80-25483
SEWAGE TREATMENT
Test methods to determine the mercury emissions from sludge incineration plants
[PB80-144611] N80-25954
SHADOWGRAPH PHOTOGRAPHY
Aero-optical characterization of aircraft optical turrets by holography, interferometry and shadowgraph N80-25593
SHAFTS (MACHINE ELEMENTS)
Hermetic seal for a shaft
[NASA-CASE-NPO-15115-1] N80-25660
Residual stress factors in torsional failure modes of inductionhardened steel axle shafts N80-25689
SHALES
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10163] N80-25738
SHALLOW WATER
Hydrological and ecological models of shallow lakes and reservoirs
[IIASA-CP-78-14] N80-25720

Discussion of questions related to hydrophysical and ecological modeling of shallow lakes and reservoirs N80-25721
The role of iron and calcium in the cycling of phosphates in shallow lakes N80-25722
The modeling of aquatic ecosystems of shallow lakes exchanging matter with sediment and with neigboring bodies of water N80-25725
Theoretical investigations into the development of an intensively used shallow lake with a river flowing into it N80-25730
SHEAR LAYERS
Prediction of optical propagation losses through turbulent boundary/shear layers N80-25595
Second moments of optical degradation due to a thin turbulent layer N80-25597
Lear jet boundary layer/shear layer laser propagation experiments N80-25602
Summary of all cycle II.5 shear and boundary layer measurements, aerodynamics N80-25604
Cycle II.5 aircraft aero-optical turbulent boundary-layer/shear-layer measurements N80-25605
SHEAR STRESS
Theoretical and physical approach to light gage steel shear diaphragms N80-25691
SHIELDING
Optimization of noise barriers
[DFVLR-FB-79-29] N80-26116
SHIP HULLS
Relation between the surface friction of plates and their statistical micrageometry
[AD-A082758] N80-25664
SHIVA LASER SYSTEM
Laser program, volume 3 — laser fusion
[UCRL-50021-78-VOL-3] N80-25650
Laser program, volume 2 — laser fusion
[UCRL-50021-78-VOL-2] N80-25651
Laser program, volume 1 — laser fusion
[UCRL-50021-78-VOL-1] N80-25652
SHOCK
Relation between the electronic structure and the shock sensitivity of nitrated secondary explosives. 3: Influence of the crystal environment
[UCRL-TRANS-11510] N80-25458
SHOCK RESISTANCE
Development of nondestructive evaluation techniques for high-temperature ceramic heat exchange components
[ANL/MSD/FE-80-1] N80-25685
SHOCK TUBES
Fluid processes in supersonic diffusion lasers N80-25646
SHOCK WAVE PROFILES
Measurement of weak shock-wave profiles
[SAND-79-8004] N80-25617
SHOCK WAVES
Droplet drag and breakup in shock-wave induced unsteady flows N80-25585
SHORELINES
Physical alterations of coastal shorelines: An analysis of Chesapeake Bay shore zone development and regulation
[PB80-149875] N80-25956
SHORT HAUL AIRCRAFT
Static and transient performance of YF-102 engine with up to 14 percent core airbleed for the quiet short-haul research aircraft
[NASA-TP-1692] N80-25339
SHORT TAKEOFF AIRCRAFT
A decision by the Secretary of Defense is needed on the AV-8B aircraft program
[PB80-143209] N80-25291
Large-scale wind-tunnel tests of inverting flaps on a STOL utility aircraft model
[NASA-TP-1696] N80-25318
SHUTTLE MISSION SIMULATOR
Orbiter/shuttle carrier aircraft separation: Wind tunnel, simulation, and flight test overview and results
[NASA-TM-58223] N80-25372
SIERRA NEVADA MOUNTAINS (CA)
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744

Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753

Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754

An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758

SIGNAL GENERATORS

CARFAX: An example of an FM signal generated using digital techniques
[BBC-RD-1980/2] N80-25512

SIGNAL PROCESSING

Minimum performance standards: Airborne Omega receiving equipment
[RTCA/DO-164A] N80-25310

Digital signal processing with an adaptive delay element N80-25537

A microprogrammable digital signal processor: Conception, design, application N80-26043

Adaptive MSE estimation algorithms N80-26047

Performance comparisons of several adaptive least mean square algorithms N80-26051

SIGNAL TRANSMISSION

A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design — tropospheric scattering
[NASA-CR-163207] N80-25520

SIGNATURE ANALYSIS

Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737

Partitioning multispectral imagery of the Earth resources
[INPE-1678-RPE/111] N80-26060

SILICON

Preliminary materials assessment for the Satellite Power System (SPS)
[DOE/ER-0038] N80-25364

Analysis and evaluation in the production process and equipment area of the low-cost solar array project
[NASA-CR-163208] N80-25782

SILVER

Silver deterioration in second surface solar mirrors
[SAND-79-8278] N80-25856

SIMULATORS

Software quality assurance: One of the software acquisition engineering guidebook series
[AD-A082425] N80-26070

SINGLE CRYSTALS

Formation and transformation of polytypes in MX2 compounds
[INPE-1735-RPE/135] N80-26177

Single crystal growth of zirconia utilizing a skull melting technique
[AD-A082323] N80-26183

SITES

Siting small wind turbines
[PNL-SA-7603] N80-25878

SKIN FRICTION

Calculation of skin-friction coefficients for low Reynolds number turbulent boundary layer flows
[NASA-CR-163082] N80-25824

SKY BRIGHTNESS

The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25781

Background sky brightness measurements for application to space surveillance systems — zodacal light and interplanetary dust
[AD-A081881] N80-26237

SKYLAB PROGRAM

User's guide for Skylab dynamics program, SKYDYN
[NASA-TM-78279] N80-26056

SLURRIES

Investigation leading to the development of an acoustic Doppler slurry flowmeter
[ANL-FE-49622] N80-25840

SMALL PERTURBATION FLOW

Transonic small perturbation equation applied to the solution of two-dimensional unsteady flows N80-25489

SNOW COVER

Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739

Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742

The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743

The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744

New goals for snow monitoring by satellite N80-25745

Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746

Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747

Application of satellite data for snow mapping in Norway N80-25748

Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749

Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750

LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751

A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejos and South Fork River basins N80-25752

Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753

Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754

Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755

Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756

Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757

An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758

The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25781

SODIUM

Thermophysical properties of sodium — liquid metal fast breeder reactors
[ANL/CEN/RSD-79-1] N80-25402

Spaced lidar and nightglow observations of an atmospheric sodium enhancement
[INPE-1675-RPE/110] N80-25974

SODIUM CHLORIDES

Short-pulse CO2-laser damage studies of NaCl and KCl windows
[LA-UR-80-108] N80-25649

SODIUM COOLING

Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 4: Commercial and pilot plant cost data
[SAN-1483-1/5] N80-25803

SOIL MAPPING

Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735

SOIL MECHANICS

A review of fabric usage in pavements constructed on low-strength soils
[AD-A083076] N80-25484

The torsional pendulum test for soils: A theoretical investigation
[PB80-154115] N80-25985

SOIL MOISTURE

HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10163] N80-25738

Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740

HCMM: Soil moisture experiment — South Alberta, Canada
[E80-10166] N80-25741

Determination of selected hydraulic properties of subarctic soils
[PB80-150956] N80-25983

SOIL SCIENCE

The torsional pendulum test for soils: A theoretical investigation
[PB80-154115] N80-25985

SOLAR ARRAYS

Analysis and evaluation in the production process and equipment area of the low-cost solar array project
[NASA-CR-163208] N80-25782

Unfulfilled technology needs in space power systems
[NASA-TM-80677] N80-25789

SOLAR CELLS

Preliminary materials assessment for the Satellite Power System (SPS)
[DOE/ER-0038] N80-25364

Investigation of reliability attributes and accelerated stress factors on terrestrial solar cells
[NASA-CR-163209] N80-25781

Amorphous silicon solar cells by hydrogen implantation
[SAN-3042-1] N80-25842

Novel solar cell concentrator photovoltaic converter system
[SAND-79-7048] N80-25843

Thin film polycrystalline silicon solar cells
[SAN-2207-3] N80-25844

Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T2] N80-25853

Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T3] N80-25854

Amorphous thin films for solar cell application
[DOE/ET-23040/1] N80-25882

Novel concentrator photovoltaic converter system development
[SAND-80-7004] N80-25912

The planar multijunction cell: A new solar cell for Earth and space
[NASA-TM-81526] N80-26182

SOLAR COLLECTORS

Heat conduction in partial vacuum
[ALO-5367-1] N80-25618

CSU Solar House 3: Solar heating and cooling system performance
[COO-3012Z-3] N80-25806

Design and test of non-evacuated solar collectors with compound parabolic concentrators
[EFI-79-42] N80-25811

Development of materials for a luminescent solar collector
[COO-4996-1] N80-25812

Design of a system using CPC collectors to collect solar energy and to produce industrial process steam
[ANL-79-102] N80-25814

Solar project description for A-Frame Industries' single family residence: Kaneohe, Hawaii
[SOLAR/1010-79/50] N80-25818

Solar collector studies for solar heating and cooling applications
[ALO-5355-T1] N80-25850

Development of a second-generation concentrating tracking solar collector
[ASE-4480] N80-25851

Cleaning agents and techniques for concentrating solar collectors
[SAND-80-7005C] N80-25860

Comparative performance of two types of evacuated tubular solar collectors in a residential heating and cooling system
[COO-2577-19] N80-25864
Reliability and maintainability evaluation of solar collector and manifold interconnections
[SOLAR/0902-79/70] N80-25866
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 1: Executive summary
[SAN-1483-1/1] N80-25875
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 2, book 1: Commercial plant conceptual design
[SAN-1483-1/2] N80-25876
Comparison between results of the HELIOS and MIRVAL computer codes applied to central receiver solar-energy collection
[SAND-79-8266] N80-26075

SOLAR COOLING

Design parameters for solar powered absorption cooling systems with chilled water storage
N80-25778
Solar heating and cooling demonstration project at Radian Corporation, Austin, Texas
[NASA-CR-161442] N80-25784
Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161450] N80-25787

SOLAR ECLIPSES

Rocket observations of solar radiation during the eclipse of 26 February 1979
[NASA-CR-163211] N80-26242
Solar eclipses. Citations from the NTIS data base
[PB80-805732] N80-26248

SOLAR ENERGY

Problems and opportunities for solar energy in biomass, pyrolysis, and gasification
[SERI/TP-332-495] N80-25810
High temperature hydrogen cycles for solar heat sources
[LA-UR-80-184] N80-25817
Solar technology application to enhanced oil recovery
[SERI/TR-352-392] N80-25839
Environmental development plan: Solar agricultural and industrial process heat
[DOE/EDP-0033] N80-25862
Data handbook for the national solar energy demonstration book
[DSE-5216-T4] N80-25873
Line-focus solar central power systems, phase1
[SAN-0115-140-1] N80-25903
Solar energy program. Chapter from the Energy and Environment Division report
[LBL-9630] N80-25904
Solar-assisted heat pump-swimming pool synergistics for domestic heating
[UCRL-83458] N80-25905
SAGE, Solar Assisted Gas Energy
[PB80-144363] N80-25906
Biosources digest, a journal on biomass utilization, volume 1, no. 1
[PB80-140973] N80-25908
Biosources digest: A journal on biomass utilization, volume 1, no. 4
[PB80-140981] N80-25909
Solar radiation data forecast and interpolation analysis. Folder 1, part 1: Executive summary. Part 2: Technical analysis (tasks 1 and 2). Part 3: Appendices (tasks 1 and 2)
[COO-4494-1] N80-25982

SOLAR ENERGY ABSORBERS

Selective paint development — solar energy absorbers
[ALO-4287-T2] N80-25448

SOLAR ENERGY CONVERSION

Test results on the Frenchman's Reef solar data acquisition and control system
[NASA-CR-161449] N80-25783
Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161450] N80-25787
Solar heating and hot water system installed at Municipal Building complex, Abbeville, South Carolina
[NASA-CR-161443] N80-25788
Solar energy system performance evaluation: Seasonal report for IBM system 1A, Huntsville, Alabama
[NASA-CR-161464] N80-25790
Solar energy system performance evaluation: Seasonal report for Solaron-Akron, Akron, Ohio
[NASA-CR-161465] N80-25791
Passive solar calculation methods
[DSE-5221-T1] N80-25798
Solar heater program: Solar applications study
[COO-2705-3] N80-25813
Solar project description for Perl-Mack Enterprises' single family residences, Denver, Colorado
[SOLAR/1015-79/50] N80-25821
Simulation and design of solar thermal processes
[COO-2588-T1] N80-25823
Solar total energy project Shenandoah
[ALO-3985-1-REV-1] N80-25825
Solar collector studies for solar heating and cooling applications
[ALO-5355-T1] N80-25850
Solar energy conversion through biophotolysis
[SAN-0034-239-T1] N80-25852
Development of polyimide materials for use in solar energy systems
[DOE/CS-35305/T1] N80-25855
Evaluation of reliability of operational solar-energy systems
[CONF-791105-2] N80-25872
Solar energy project: An overview
[DOE/CS-0124] N80-25883
Photochemical determinants of the efficiency of photogalvanic conversion of solar energy
[COO-2869-5] N80-25886
Optimization of solar assisted heat pump systems via a simple analytic approach
[BNL-27316] N80-25896
SAGE, Solar Assisted Gas Energy
[PB80-153836] N80-25907
Optical properties of metallic surfaces, small particles and composite coatings for solar energy conversion applications
[DOE/ET-20413/1] N80-26143
An open cycle turbine solar thermal power system
N80-26257

SOLAR FLARES

Solar-geophysical data number 423, part 1. Prompt Reports: Data for October 1979, September 1979
[PB80-146160-SGD-423-PT-1] N80-26244
Solar-geophysical data numer 423, part 2. Comprehensive Reports. Data for May 1979, March 1979 and miscellanea
[PB80-146178] N80-26245

SOLAR FLUX

The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25781

SOLAR FURNACES

Solarization of heliostat glasses
[SAND-79-8754] N80-25858

SOLAR GENERATORS

Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 4: Commerical and pilot plant cost data
[SAN-1483-1/5] N80-25803
Conceptual design and analysis of a 100 MWe distributed line focus solar central power plant
[SAN-2073-1] N80-25826
An open cycle turbine solar thermal power system
N80-26257

SOLAR HEATING

Application of reliability, maintainability, and availability engineering to solar heating and cooling systems
[CONF-800103-3] N80-25687
Solar heating and cooling demonstration project at Radian Corporation, Austin, Texas
[NASA-CR-161442] N80-25784
Solar heating system installed at Telex Communications, Inc., Blue Earth, Minnesota
[NASA-CR-161437] N80-25786
Solar heating and hot water system installed at Municipal Building complex, Abbeville, South Carolina
[NASA-CR-161443] N80-25788
Heating a fluid in full flow inside a horizontal cyclindrical pipe using solar energy
[INPE-1680-TDL/020] N80-25796
Passive solar calculation methods
[DSE-5221-T1] N80-25798
CSU Solar House 3: Solar heating and cooling system performance
[COO-30122-3] N80-25808
Superior heat transfer fluids for solar heating and cooling applications
[ALO-35356-1] N80-25815
Solar energy system performance evaluation. Albuquerque Western no. 1, Albuquerque, New Mexico
[SOLAR/1011-79/14] N80-25818
Solar project description. Albuquerque Western-2 multi-dwelling building Albuquerque, New Mexico
[SOLAR/1090-79/50] N80-25819
Solar energy performance evaluation. Zien Mechanical Contractors no. 1: Single-family residence, Milwaukee, Wisconsin
[SOLAR/1057-79/14] N80-25820
West Chester Work Center: Solar space heating demonstration project
[DOE/CS-4048/2] N80-25822
Two-tank seasonal storage concept for solar space heating of buildings
[CONF-791226-2] N80-25867
Evaluation of reliability of operational solar-energy systems
[CONF-791105-2] N80-25872
Analysis of community solar systems for combined space and domestic hot water heating using annual cycle thermal energy storage
[SERI/TP-355-570] N80-25900
Proposed energy-performance standards for new buildings: Passive and active solar-heating analysis
[DOE/CS-0117] N80-25902
Evaluation of the typical meteorological years for solar heating and cooling system studies
[SERI/TR-8150-1] N80-26001

SOLAR HOUSES

Solar project description for A-Frame Industries' single family residence: Kaneohe, Hawaii
[SOLAR/1010-79/50] N80-25818

SOLAR POWER SATELLITES

The solar power satellite concepts: The past decade and the next decade
[NASA-TM-81000] N80-25360
Preliminary materials assessment for the Satellite Power System (SPS)
[DOE/ER-0036] N80-25364
Effects of construction and operation of a satellite power system upon the magnetosphere — injection of orbit transfer vehicle exhaust
[ATR-80(7824)-1] N80-25365
Preliminary environmental assessment for the Satellite Power System (SPS), revision 1. Volume 1: Executive summary
[DOE/ER-0036/1] N80-25874

SOLAR RADIATION

Variability of solar radiation at four selected stations in the United States
[COO-4521-1] N80-25979
Solar radiation data forecast and interpolation analysis. Folder 1, part 1: Executive summary. Part 2: Technical analysis (tasks 1 and 2). Part 3: Appendices (tasks 1 and 2)
[COO-4494-1] N80-25982
Rocket observations of solar radiation during the eclipse of 26 February 1979
[NASA-CR-163211] N80-26242

SOLAR REFLECTORS

Silver deterioration in second surface solar mirrors
[SAND-79-8276] N80-25856
Use of thin glass reflectors for solar concentrators
[SAND-80-0109C] N80-25857

SOLAR TERRESTRIAL INTERACTIONS

Solar eclipses. Citations from the NTIS data base
[PB80-805732] N80-26248

SOLAR TOTAL ENERGY SYSTEMS

Solar total energy project Shenandoah
[ALO-3985-1-REV-1] N80-25825

SOLAR WIND

The plasma boundary layer and magnetopause layer of the Earth's magnetosphere N80-25859
Aspects of solar wind theories
[INPE 1636-RPE/095] N80-26243

SOLDERS
Thermal fatigue evaluation of solder alloys
[BDX-613-2341] N80-25429
SOLID ELECTRODES
Surface voltammetry and coulometry of solid electrodes N80-25369
SOLID ROCKET PROPELLANTS
Nitramine monopropellant deflagration and general nonsteady reacting rocket chamber flows N80-25373
SOLID STATE
Relationship of the geometry of the observed steady state chemical conversion rate to the basic surface reaction process in electrochemistry
[ISM-243] N80-25397
Lattice dynamics with short-range correlations applied to two-phonon Raman scattering N80-26175
Solid state crystal physics at very low temperatures
[NASA-CR-163240] N80-26181
SOLIDIFICATION
Solidification behavior of austenitic stainless steel filler metals
[ORNL/TM-7116] N80-25424
SONIC BOOMS
Aircraft sonic boom: Effects on buildings. Citations from the NTIS data base
[PB80-806334] N80-25304
SOUND FIELDS
A theoretical and experimental investigation of the effects of the interaction between an acoustic field and cylindrical structure on sound transmission loss N80-26114
SOUND GENERATORS
Notes on various noise sources N80-25486
SOUND LOCALIZATION
Digital wavefront reconstruction for acoustical applications N80-26112
SOUND TRANSMISSION
A theoretical and experimental investigation of the effects of the interaction between an acoustic field and cylindrical structure on sound transmission loss N80-26114
SOUND WAVES
Notes on various noise sources N80-25486
Spectrum of acoustic waves excited in single and multiple layered crystalline media N80-26174
SOUNDING ROCKETS
The 193089 MLRS, missile no. 1125, round no. V-96, 11 December 1979
[AD-A082969] N80-26000
SOUTH AMERICA
Longitudinal and latitudinal abnormalities in the daily variation of fDF2 in the South American region
[INPE-1722-RPE/127] N80-25969
Comparison of fDF2 characteristics at nearby equatorial locations in the South American region
[INPE-1737-RPE/136] N80-25970
A climatological study of the wind and temperature fields for the upper levels over South America
[INPE-1672-TDL/017] N80-25999
SOUTH CAROLINA
Solar heating and hot water system installed at Municipal Building complex, Abbeville, South Carolina
[NASA-CR-161443] N80-25788
SOUTHERN HEMISPHERE
Some observed and theoretical aspects of the sudden stratospheric heating in the Northern and Southern Hemispheres
[INPE-1671-TDL/016] N80-25976
SPACE COLONIES
Space Colonies. Citations from the International Aerospace Abstracts data base
[NASA-CR-163204] N80-25353
SPACE EXPLORATION
Images of Mars: The Viking extended mission
[NASA-SP-444] N80-26239
SPACE FLIGHT TRAINING
Water immersion facility Johnson Space Center
[GPO-54-508] N80-25348
SPACE HEATING (BUILDINGS)
Solar heating system installed at Telex Communications, Inc., Blue Earth, Minnesota
[NASA-CR-161437] N80-25786
Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161450] N80-25787
Solar heating and hot water system installed at Municipal Building complex, Abbeville, South Carolina
[NASA-CR-161443] N80-25788
Solar energy system performance evaluation: Seasonal report for IBM system 1A, Huntsville, Alabama
[NASA-CR-161484] N80-25790
Solar energy system performance evaluation: Seasonal report for Solaron-Akron, Akron, Ohio
[NASA-CR-161485] N80-25791
Solar project description. Albuquerque Western-2 multi-dwelling building Albuquerque, New Mexico
[SOLAR/1080-79/50] N80-25819
Solar energy performance evaluation. Zien Mechanical Contractors no. 1: Single-family residence, Milwaukee, Wisconsin
[SOLAR/1057-79/14] N80-25820
West Chester Work Center: Solar space heating demonstration project
[DOE/CS-4048/2] N80-25822
Two-tank seasonal storage concept for solar space heating of buildings
[CONF-791226-2] N80-25867
Multi-use geothermal energy system with augmentation for enhanced utilization. A non-electric application of geothermal energy in Susanville, California
[SAN-1740-2] N80-25868
Heat-pump-centered integrated community energy systems: Systems development, Consolidated Natural Gas Service Company
[ANL/CNSV/TM-29] N80-25890
Analysis of community solar systems for combined space and domestic hot water heating using annual cycle thermal energy storage
[SERI/TP-365-570] N80-25900
SPACE LAW
Agreement governing the activities of states on the Moon and other celestial bodies, parts 1 and 2
[GPO-99-896] N80-26139
SPACE PROCESSING APPLICATIONS ROCKET
SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids
[NASA-CR-161473] N80-25354
SPACE SHUTTLE ORBITERS
EPS analysis of nominal STS-1 flight
[NASA-TM-81001] N80-25368
MCC level C formulation requirements. Shuttle TAEM targeting
[NASA-TM-80795] N80-25370
STS-1 operational flight profile. Volume 5: Descent, cycle 3
[NASA-TM-81077] N80-25371
Orbiter/shuttle carrier aircraft separation: Wind tunnel, simulation, and flight test overview and results
[NASA-TM-58223] N80-25372
Shuttle Ku-band and S-band communications implementation study
[NASA-CR-160662] N80-25522
SPACE SHUTTLES
Orbiter/shuttle carrier aircraft separation: Wind tunnel, simulation, and flight test overview and results
[NASA-TM-58223] N80-25372
Study of elcharts for corrosion-resistant metals, space shuttle external tank
[NASA-CR-161431] N80-25414
Critique of the Hughes Aircraft shuttle Ku band leading edge bit synchronizer
[NASA-CR-160661] N80-25521
A diffusion climatology for Cape Canaveral, Florida
[NASA-TM-58224] N80-25994
SPACE STATIONS
Space Colonies. Citations from the International Aerospace Abstracts data base
[NASA-CR-163204] N80-25353
SPACE SURVEILLANCE
Background sky brightness measurements for application to space surveillance systems — zodiacal light and interplanetary dust
[AD-A081851] N80-26237
SPACE TRANSPORTATION SYSTEM
STS-1 operational flight profile. Volume 5: Descent, cycle 3
[NASA-TM-81077] N80-25371
Orbiter/shuttle carrier aircraft separation: Wind tunnel, simulation, and flight test overview and results
[NASA-TM-58223] N80-25372
SPACE TRANSPORTATION SYSTEM FLIGHTS
Vector wind profile gust model
[NASA-CR-161474] N80-25992
Vector wind profile gust model
[NASA-CR-161475] N80-25993
SPACE TRANSPORTATION SYSTEM 1 FLIGHT
EPS analysis of nominal STS-1 flight
[NASA-TM-81001] N80-25368
SPACE-TIME FUNCTIONS
Resolution of Navier-Stokes equations by a space-time pseudo-spectral method N80-25487
SPACEBORNE EXPERIMENTS
SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids
[NASA-CR-161473] N80-25354
F-104 low-gravity calibration tests for materials processing in space precursory experiments
[NASA-TM-78278] N80-25355
The Goddard program of gamma ray transient astronomy
[NASA-TM-80675] N80-26230
SPACECRAFT COMMUNICATION
Study of advanced communications satellite systems based on SS-FDMA
[NASA-CR-159778] N80-25357
A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design — tropospheric scattering
[NASA-CR-163207] N80-25520
SPACECRAFT CONSTRUCTION MATERIALS
The solar power satellite concepts: The past decade and the next decade
[NASA-TM-81000] N80-25360
SPACECRAFT MOTION
User's guide for Skylab dynamics program, SKYDYN
[NASA-TM-78279] N80-26056
SPACECRAFT POWER SUPPLIES
Unfulfilled technology needs in space power systems
[NASA-TM-80677] N80-25789
SPACECRAFT TRAJECTORIES
STS-1 operational flight profile. Volume 5: Descent, cycle 3
[NASA-TM-81077] N80-25371
SPACELAB
AGARD highlights
[AD-A082960] N80-25262
SPARK IGNITION
Improving the performance and fuel consumption of dual chamber stratified charge spark ignition engines
[COO-4493-5] N80-25689
SPECTRAL BANDS
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759
SPECTRAL RECONNAISSANCE
Applications of remote sensing to emergency management
[AD-A082243] N80-25765
SPECTRAL REFLECTANCE
New goals for snow monitoring by satellite N80-25745
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25761
SPECTRAL SIGNATURES
Use of mass spectroscopy for contamination control
[MLM-2686] N80-25405
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta
[E80-10152] N80-25734
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment
[E80-10160] N80-25736
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737

Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749

Algorithms for sample classification and image feature selection — remote sensing of Earth resources
[INPE-1718-RPE/124] N80-26059

SPECTROPHOTOMETRY

The discovery of optical emission from the SNR G 126.2 + 1.6
[NASA-TM-80708] N80-26229

SPECTRUM ANALYSIS

Resolution of Navier-Stokes equations by a space-time pseudo-spectral method N80-25487

The Goddard program of gamma ray transient astronomy
[NASA-TM-80675] N80-26230

High resolution spectroscopy of two gamma-ray bursts in November 1978
[NASA-TM-80575] N80-26252

Maximum entropy spectral analysis of geomagnetic disturbing indices
[INPE-1693-RPE/120-REV] N80-26253

SPECULAR REFLECTION

Geometry of Orbiting Earth Satellites (GOES)
[AD-A082381] N80-25362

SPHERES

Motion of a sphere in the presence of a plane interface, 1. Modeling of non-isothermal turbulent flows, 2 N80-25682

SPRAYED COATINGS

Materials Coating Techniques
[AGARD-LS-106] N80-25499

Sprayed coatings N80-25503

Applications of sprayed coatings N80-25507

SPUTTERING

Sputtering of multicomponent surfaces: Surface composition changes under ion bombardment and angular ejection distributions of sputtered species N80-25411

High rate physical vapor deposition processes N80-25500

STAINLESS STEELS

Forging evaluation of 304L stainless steel
[RFP-2997] N80-25420

Notch and hydrogen effects on sensitized 21-6-9 stainless steel
[DP-MS-79-22] N80-25422

Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-64] N80-25428

Corrosion of stainless steel, volume 2. Citations from the NTIS data base
[PB80-805906] N80-25442

Measured residual stresses in type 304 stainless steel piping butt weldments
[DOE/TIC-11126] N80-25712

STANDARDS

Minimum performance standards: Airborne Omega receiving equipment
[RTCA/DO-164A] N80-25310

Journal of research of the National Bureau of Standards, volume 85, no. 1 — aqueous electrolytes, iridium-192 gamma ray sources, air density at differing altitude, and isotopic abundance of thallium
[PB80-146566] N80-25377

CII Honeywell Bull COBOL V-50.124-4
[PB80-146012] N80-26080

STARK EFFECT

Stark effect spectrophone for continuous absorption spectra monitoring
[NASA-CASE-NPO-15102-1] N80-25538

STATIC TESTS

Static and transient performance of YF-102 engine with up to 14 percent core airbleed for the quiet short-haul research aircraft
[NASA-TP-1692] N80-25339

STATISTICAL ANALYSIS

Reduction of measured data and a method of early detection of sensor breakdown N80-25283

Handbook of airline statistics: Supplement
[PB80-138407] N80-25309

Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
[AD-A082494] N80-25313

On problems of estimation for two parameter decreasing failure rate distributions applied to reliability
[AD-A082991] N80-25682

Bayesian reliability theory for repairable equipment
[AD-A083009] N80-25684

An investigation of the feasibility of improving oculometer data analysis through application of advanced statistical techniques
[NASA-CR-163238] N80-26055

Two sample location and scale tests for distributions with the same finite interval of support N80-26103

A proposed solution to the Behrens-Fisher problem N80-26104

Research on data analysis in the physical sciences
[COO-2310-6] N80-26111

Analysis of the uncertainties associated with cost estimation
[INPE-1692-TDL/022] N80-25197

STATISTICAL DISTRIBUTIONS

Statistical analysis of multivariate atmospheric variables — cloud cover
[NASA-CR-161472] N80-25991

A comparison of smooth empirical Bayes estimators N80-26102

STATISTICAL MECHANICS

Steady state Boltzmann equation solution by numerical relaxation
[DOE/ET-15422/T3] N80-26095

STEADY FLOW

Experimental determination of unsteady blade element aerodynamics in cascades. Volume 1: Torsion mode cascade
[NASA-CR-159831] N80-25335

STEAM

Boiling heat transfer and critical heat flux in helical coils N80-25576

Design of a system using CPC collectors to collect solar energy and to produce industrial process steam
[ANL-79-102] N80-25814

STEAM TURBINES

Gas and steam turbines, general: Corrosion and erosion, Volume 2. Citations from the NTIS data base
[PB80-806664] N80-25342

Gas and steam turbines, general: Corrosion and erosion. Citations from the engineering index data base
[PB80-806672] N80-25343

STEELS

Section size effects on toughness of various cast steels N80-25410

Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[FE-3050-T2] N80-25421

Residual stress factors in torsional failure modes of inductionhardened steel axle shafts N80-25689

The effect of crack length and side grooves on the ductile fracture toughness properties of ASTM A533 steel
[NUREG-CR-1171] N80-25709

Tensile properties of irradiated and unirradiated welds of A533 steel plate and A508 forgings
[NUREG-CR-1158] N80-25710

Stability, toughness, and crack propagation in steel wires and bars
[LPC-89] N80-25716

STELLAR ATMOSPHERES

Atmospheres for hot, high-gravity, pure helium stars N80-26224

Calculations of NLTE carbon 2-4 spectra in line-blanketed model atmospheres of early-type stars N80-26225

An analysis of the atmosphere of the RV Tauri star AC Herculis N80-26226

STELLAR LUMINOSITY

Surface photometry of the Coma Cluster of galaxies N80-26223

Light curve of type I supernovae
[LA-UR-80-463] N80-26232

STELLAR MASS ACCRETION

Periodic mass transfer in the X-ray binary system Her X-1/HZ Her N80-26227

STELLAR MASS EJECTION

Periodic mass transfer in the X-ray binary system Her X-1/HZ Her N80-26227

STELLAR RADIATION

Light curve of type I supernovae
[LA-UR-80-463] N80-26232

STELLAR SPECTRA

Is the remnant of SN1006 crab-like?
[NASA-TM-80659] N80-26251

STEREOSCOPY

Viking orbiter stereo imaging catalog
[NASA-CR-3277] N80-26240

STIFFNESS

Rotor-bearing dynamics technology design guide. Part 4: Cylindrical roller bearings
[AD-A082355] N80-25662

STIMULATED EMISSION

Stimulated Raman scattering from an underdense hydrogen plasma N80-26150

STOCHASTIC PROCESSES

An adaptive Bayesian scheme for estimating reliability growth under exponential failure times
[AD-A083006] N80-25683

STORAGE

Strategic petroleum reserve
[DOE/RA-0047] N80-25789

Comparative method for the evaluation of array reflector materials
[ORNL/CSD-42] N80-25877

STORAGE RINGS (PARTICLE ACCELERATORS)

Two-dimensional equilibrium of field-reversed ion rings
[INPE-1724-RPE/129-REV] N80-26153

STORAGE STABILITY

Bulk polymerization and stability of anaerobic adhesives
[MLM-2647] N80-25450

Development and characterization of solidified forms for high level wastes
[PNL-3060] N80-26132

STORAGE TANKS

Hybrid thermal storage with water
[ESG-DOE-13259] N80-25891

STORM DAMAGE

Simulated hail test facility
[SAND-79-1114] N80-25349

STORMS (METEOROLOGY)

Case studies of convective storms. Case study 4: First echoe case, 27 July 1976
[PB80-143233] N80-26007

Case studies on convective storms. Case study 5: First echo case, 12 July 1978
[PB80-143241] N80-26008

Mariners weather log, volume 23, no. 6
[PB80-145113] N80-26011

Internal storm motions from a single non-Doppler weather radar
[PB80-143068] N80-26018

STRAIN GAGES

Cyclic plastic deformation follower N80-25490

STRAIN HARDENING

A presentation for the deformation of a metal including the effects of strain hardening and recrystallization N80-25408

STRATOSPHERE

On the efficiency of meridional eddy transport processes during the major stratospheric warming of January 1977
[INPE-1687-RPE/118] N80-25968

Some observed and theoretical aspects of the sudden stratospheric heating in the Northern and Southern Hemispheres
[INPE-1671-TDL/016] N80-25976

STREETS

Assessment of methods for control of fugitive emissions from paved roads
[PB80-139330] N80-25495

STRESS (PHYSIOLOGY)

The relationship of exercise performance to variations in blood acid-base status induced by changes in the inspired oxygen fraction N80-26030

Development of an automated stress/duress detection system, phase 1 and phase 2
[SAND-79-7038] N80-26036

STRESS (PSYCHOLOGY)

Development of an automated stress/duress detection system, phase 1 and phase 2
[SAND-79-7038] N80-26036

STRESS ANALYSIS

Sudden stretching of a four layered composite plate
[NASA-CR-159870] N80-25383

Sudden bending of cracked laminates
[NASA-CR-159860] N80-25384

Frictional damping at unlubricated metallic interfaces N80-25657

Computer program for elastic analysis of piping systems with special reference to the power piping code B31.1
[MT-135] N80-25697
Inelastic transient stress analysis for thermal and mechanical loading N80-25699
Collapse of experimental capsules under external pressure
[PNL-3185] N80-25705
The application of holography to stress analysis
[UPC-84] N80-25715
Mechanical and dielectric properties of optical films
[UCRL-15098] N80-26144

STRESS CONCENTRATION
The concept of effective stress applied to elasticity and to viscoplasticity in the presence of anisotropic damage
[RAE-LIB-TRANS-2039] N80-25696

STRESS CORROSION
Advances in materials science
[UCRL-50059-79-3] N80-25376
Hydrogen sulphide stress corrosion cracking in materials for geothermal power
[COO-2602-7] N80-25707

STRESS CORROSION CRACKING
Evaluation of the stress corrosion cracking resistance of several high strength low alloy steels
[NASA-TM-78276] N80-25413

STRESS TENSORS
Variational formulation of the plate equilibrium problem. Application to isoparametric finite elements of plates, part 1 N80-26259

STRESS-STRAIN RELATIONSHIPS
Structural layout with stress-displacement and fabrication limits N80-25700
Incremental stress-strain law for graphite under multiaxial loadings
[GA-A-15573] N80-25704

STRIP MINING
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735

STRUCTURAL ANALYSIS
Computer control for a cladding thickness tester
[DP-1537] N80-25645
Reliability of structural systems N80-25690

STRUCTURAL DESIGN
Thermal-structural design study of an airframe-integrated Scramjet
[NASA-CR-159039] N80-25334
Design of viewing windows for controlled-atmosphere chambers
[ORNL/TM-6864] N80-25350
Criteria for controlled atmosphere chambers
[ORNL/TM-6865] N80-25351
Theoretical and physical approach to light gage steel shear diaphragms N80-25691
Structural layout with stress-displacement and fabrication limits N80-25700

STRUCTURAL DESIGN CRITERIA
Structural layout with stress-displacement and fabrication limits N80-25700
Development of lightweight mine roof supports
[PB80-143936] N80-25774
Seismic safety margins research program load combination project. Task 3: Load combination methodology development
[UCID-18149] N80-25981

STRUCTURAL PROPERTIES (GEOLOGY)
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10183] N80-25736
Geophysical and hydrologic prediction of fissuring and land subsidence, south-central Arizona
[PB80-151434] N80-25777

STRUCTURAL STABILITY
Aircraft sonic boom: Effects on buildings. Citations from the NTIS data base
[PB80-806334] N80-25304
Variational formulation of the plate equilibrium problem. Application to isoparametric finite elements of plates, part 1 N80-26259

STRUCTURAL VIBRATION
La Recherche Aerospatiale, Bimonthly Bulletin Number 1979-6
[ESA-TT-632] N80-26255
Numerical bracketing of the Eigenvalues of complex linear structures N80-26260
Identification of the elastic characteristics of composite materials by means of vibration tests and a model of discrete conservative calculation N80-26261

STRUCTURAL WEIGHT
Development of lightweight mine roof supports
[PB80-143936] N80-25774

STRUCTURES
The combination of aerial and terrestrial photogrammetry in structural monitoring N80-25963

SUBSIDENCE
Geophysical and hydrologic prediction of fissuring and land subsidence, south-central Arizona
[PB80-151434] N80-25777

SUBSTRUCTURES
Permanent deformation of cohesionless subgrade material under cyclic loading N80-25682

SULFUR DIOXIDES
High temperature corrosion Studies. A. Iron: Based superalloy in SO2/O2 atmospheres. B. Gas: Solid reaction with formation of volatile species
[IS-T-893] N80-25430
Solid sorbent for collecting atmospheric sulfur dioxide
[PB80-131949] N80-25948

SULFUR FLUORIDES
Atmospheric distributions, sources and sinks of selected halocarbons, hydrocarbons, SF6, and N2O
[PB80-142706] N80-25934

SULFUR OXIDES
Cross-country urban and rural measurements of NOx and SO2
[PB80-137227] N80-25955

SULFURIC ACID
Development of an automatic H2SO4 monitor — pollution control
[PB80-138191] N80-25957

SUPERCONDUCTING MAGNETS
Radiation effects on organic insulators for superconducting magnets
[ORNL/TM-7077] N80-25551
Superconducting Magnetic Energy Storage (SMES) program
[LA-8199-PR] N80-25805

SUPERCONDUCTIVITY
Superconductivity in the lanthanum-yttrium-manganese alloy system
[IS-T-885] N80-25554
Fabrication and diagnostics of oxide tunneling barriers in niobium based superconductive tunnel junctions N80-26176

SUPERCONDUCTORS
Flux-line-cutting threshold in type-2 superconductors
[IS-T-894] N80-25493
Comparison of flying capacitor bridge circuits and inductor-convertor bridge circuits for the transfer of energy between superconducting coils
[CONF-791075-4] N80-25546

SUPERFLUIDITY
Viscosity of He3 in superfluid and Fermi liquid regimes N80-25482

SUPERHIGH FREQUENCIES
Critique of the Hughes Aircraft shuttle Ku band leading edge bit synchronizer
[NASA-CR-160661] N80-25521
Shuttle Ku-band and S-band communications implementation study
[NASA-CR-160662] N80-25522

SUPERNOVA REMNANTS
The discovery of optical emission from the SNR G 126.2 + 1.6
[NASA-TM-80708] N80-26228
The evolution of supernova remnants in different galactic environments, and its effects on supernova statistics
[NASA-TM-80707] N80-26236
Is the remnant of SN1006 crab-like?
[NASA-TM-80689] N80-26251

SUPERNOVAE
Light curve of type I supernovae
[LA-UR-80-463] N80-26232
Nuclear gamma ray lines from supernovae
[RPE-1685-RPE/105] N80-26254

SUPERSONIC COMBUSTION RAMJET ENGINES
Thermal-structural design study of an airframe-integrated Scramjet
[NASA-CR-159039] N80-25334

SUPERSONIC DIFFUSERS
Fluid processes in supersonic diffusion lasers N80-25646

SUPERSONIC FLOW
Stability of the laminar boundary layer on a blunted plate in supersonic flow N80-25292
A two-dimensional unsteady Euler equation solver for flows in arbitrarily shaped regions using a modular concept N80-25293
An approximation and an associated numerical method for two-dimensional steady supersonic gas dynamics N80-25567

SUPERSONIC INLETS
Windtunnel tests of a tubular supersonic inlet for projectiles
[DFVLR-FB-79-26] N80-25367

SUPPORTS
Development of lightweight mine roof supports
[PB80-143936] N80-25774

SURFACE ACOUSTIC WAVE DEVICES
Surface acoustic wave microwave oscillator and frequency synthesizer
[AD-A082351] N80-25544

SURFACE FINISHING
Laser surface alloying N80-25504
Cleaning agents and techniques for concentrating solar collectors
[SAND-80-7005C] N80-25860

SURFACE REACTIONS
Surface voltammetry and coulometry of solid electrodes N80-25389
Relationship of the geometry of the observed steady state chemical conversion rate to the basic surface reaction process in electrochemistry
[ISM-243] N80-25397
Sputtering of multicomponent surfaces: Surface composition changes under ion bombardment and angular ejection distributions of sputtered species N80-25411

SURFACE ROUGHNESS
Runway surface roughness N80-25326
Determination of friction factors and heat transfer coefficients for flow past artificially roughened surfaces
[DOE/TIC-10283] N80-25629

SURFACE TEMPERATURE
Use of a new analytical technique to determine heat input from inner surface temperatures measured on a hemispherical shell during a free flight experiment
[WSRL-0069-TR] N80-25587
Correlation of nosetip boundary-layer transition data measured in ballistics-range experiments
[SAND-79-0649C] N80-25626
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25783
The climatic impact of sea surface temperature anomalies on zonally symmetric and asymmetric flows: A quasi-geostrophic modeling approach N80-26022

SURFACE WATER
Hydrological and ecological models of shallow lakes and reservoirs
[IIASA-CP-78-14] N80-25720
Evaluation of available phosphorus models — phosphorus loading in lakes N80-25729

SURFACES
The influence of ballistic damage on the aeroelastic characteristics of lifting surfaces — fighter aircraft
[AD-A082536] N80-25322

SURVIVAL
Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307
Aircraft survival design guide. Volume 5: Aircraft postcrash survival
[AD-A082513] N80-25308

SWITCHING CIRCUITS
Nanosecond pulsers for MM wave tubes
[AD-A080966] N80-25542
Switching circuits, volume 2. Citations from the NTIS data base
[PB80-805880] N80-25580

Switching circuits. Citations from the Engineering Index data base
[PB80-805898] N80-25561

SWITCHING THEORY
Switching circuits, volume 2. Citations from the NTIS data base
[PB80-805880] N80-25560
Switching circuits. Citations from the Engineering Index data base
[PB80-805898] N80-25561

SWITZERLAND
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755

SYNCHRONIZED OSCILLATORS
Synchronization of weakly coupled relaxation oscillators — starting with Mishchenko's theorem
[MC-TW-180/78] N80-26098

SYNCHRONIZERS
Critique of the Hughes Aircraft shuttle Ku band leading edge bit synchronizer
[NASA-CR-160661] N80-25521

SYNCHRONOUS SATELLITES
A method of producing analytical orbit models for geostationary satellites
[DFVLR-FB-79-16] N80-25366
Technical note APT/WEFAX 79-W2
[INPE-1727-NTE/159] N80-25905

SYNCHROTRONS
Important atomic collision processes in the heavy ion inertial fusion program
[SAN-0115-137-1] N80-26129
Synchrotron cooling and annihilation of an E(+)-E(-) plasma: The radiation mechanism for the March 5, 1979 transient
[NASA-TM-80674] N80-26229

SYNOPTIC METEOROLOGY
Introduction to interpreting satellite imagery
[INPE-1681-RPE/113] N80-25999
Synoptic meteorology and air quality patterns in the St. Louis RAPS program
[PB80-148299] N80-26012

SYNTAX
The induction of the syntax of natural language by computer N80-26050

SYNTHANE
Synthane pilot plant, South Park Township, Pennsylvania
[COO-0003-41-T1] N80-25455

SYNTHETIC FUELS
Synthetic fuels: Methane, volume 1. Citations from the Engineering Index data base
[PB80-805245] N80-25478
Synthetic fuels: Methane, volume 2. Citations from the Engineering Index data base
[PB80-805252] N80-25479

SYSTEMS ANALYSIS
EPS analysis of nominal STS-1 flight
[NASA-TM-81001] N80-25368
Systems engineering for power: Organizational forms for large scale systems, volume 1
[CONF-790904-P2] N80-25808
Solar radiation data forecast and interpolation analysis. Folder 1, part 1: Executive summary. Part 2: Technical analysis (tasks 1 and 2). Part 3: Appendices (tasks 1 and 2)
[COO-4494-1] N80-25982
Modelling and resource allocation of linearly restricted operating systems
[AD-A082363] N80-26046
NDTRAN: Interpreter of dynamic systems N80-26058
A language for simulating dynamic hierarchical systems
[INPE-1728-TDL/024] N80-26061
REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program
[AD-A082735] N80-26072

SYSTEMS ENGINEERING
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 1
[AD-A081233] N80-25314
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 2: Appendices
[AD-A081133] N80-25315
Communication satellite technology: State of the art and development opportunities
[NASA-CR-159977] N80-25358
Design and development of a hard tube flexible radiator system
[NASA-CR-160653] N80-25380
A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design — tropospheric scattering
[NASA-CR-163207] N80-25520
Design parameters for solar powered absorption cooling systems with chilled water storage N80-25778
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 4: Commerical and pilot plant cost data
[SAN-1483-1/5] N80-25803
Superconducting Magnetic Energy Storage (SMES) program
[LA-8199-PR] N80-25805
Systems engineering for power: Organizational forms for large scale systems, volume 1
[CONF-790904-P2] N80-25808
Development of a practical photochemical energy storage system. The norbornadiene-quadricyclene energy storage system
[SRO-0893-17] N80-25869
Requirement definition and preliminary design of a photovoltaic central power station experimental test facility
[SAND-79-7022-VOL-1] N80-25870
Design and fabrication of a low-cost Darrieus vertical axis wind turbine system, phase 1
[ALO-4272] N80-25899
Near hybrid passenger vehicle development program, phase 1. Appendices C and D, Volume 2
[NASA-CR-163331] N80-26202

T

T-38 AIRCRAFT
High-speed T-38A landing gear extension loads
[NASA-TM-58226] N80-25319

TABLES (DATA)
Handbook of airline statistics: Supplement
[PB80-136407] N80-25309

TAIL ASSEMBLIES
Flight service evaluation of an advanced composite empennage component on commercial transport aircraft
[NASA-CR-159286] N80-25320

TANGENTS
Unified higher order path and envelope curvature theories in kinematics N80-26110

TARGET ACQUISITION
Active/passive long wavelength infrared (LWIR) laser guidance
[AD-A082509] N80-25647

TASKS
REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program
[AD-A082735] N80-26072

TECHNOLOGICAL FORECASTING
Cogeneration technology alternatives study. Volume 1: Summary report
[NASA-CR-159759] N80-25792
Cogeneration technology alternatives study. Volume 2: Industrial process characteristics
[NASA-CR-159760] N80-25793
Cogeneration technology alternatives study. Volume 4: Heat Sources, balance of plant and auxiliary systems
[NASA-CR-159762] N80-25794
Cogeneration technology alternatives study. Volume 6: Computer data
[NASA-CR-159764] N80-25795
Long-term supply curves for geothermal energy: The impacts of technology
[PNL-3072] N80-25865
Technology assessment: The impact of robots
[PB80-142268] N80-26041

TECHNOLOGIES
Community colleges and appropriate technology
[PB80-131634] N80-26220

TECHNOLOGY ASSESSMENT
Diamond technology study — using diamonds in traveling wave tubes
[AD-A081928] N80-25545
Hybrid microelectronic circuits, volume 3. Citations from the Engineering Index data base
[PB80-805930] N80-25563
Semiconductor measurement technology: Comprehensive test pattern and approach for characterizing SOS technology
[PB80-147952] N80-25565
Aero-optics overview — laser applications N80-25612
Wind energy applications in agriculture: Executive summary
[DOE/SEA-1109-20401-79/2] N80-25807
Ocean energy systems. Fiscal year 1979
[DOE/ET-0118] N80-25824
Numerical weather prediction and its outlook in Brazil
[INPE-1670-RPE/108] N80-25996
Technology assessment: The impact of robots
[PB80-142268] N80-26041
Advanced subsystems for practical electric vehicles. Electric and Hybrid Vehicle Subsystems Technology Development Program
[DOE/CS-0102/1] N80-26214
Impact of advanced group rapid transit technology
[PB80-153323] N80-26219

TECHNOLOGY TRANSFER
Applications of a reconfigurable array of flexible processors in intelligence information retrieval
[AD-A082324] N80-26195

TECHNOLOGY UTILIZATION
Analysis of tentative seismic design provisions for buildings
[PB80-129182] N80-25496
Application of remote sensing to state and regional problems — mississippi
[E80-10153] N80-25735
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759
Solar project description for Perl-Mack Enterprises' single family residences, Denver, Colorado
[SOLAR/1015-79/50] N80-25821
West Chester Work Center: Solar space heating demonstration project
[DOE/CS-4048/2] N80-25822
Data handbook for the national solar energy demonstration book
[DSE-5216-T4] N80-25873

TELECOMMUNICATION
VHF air-ground communication technology and spectrum utilization
[RTCA/DO-169] N80-25510
A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design — tropospheric scattering
[NASA-CR-163207] N80-25520

TELEMETRY
Data extraction and calibration of TIROS-N/NOAA radiometers
[PB80-150824] N80-25772
Development of an automated stress/duress detection system, phase 1 and phase 2
[SAND-79-7036] N80-26036

TELESCOPES
Measurement of external forces and torques on a large pointing system N80-25610

TELEVISION SYSTEMS
Satellite television. Citations from the NTIS data base
[PB80-806318] N80-25531
Satellite television transmission. Citations from the Engineering Index data base
[PB80-806318] N80-25532

TELEVISION TRANSMISSION
NBS time and frequency dissemination services
[PB80-147747] N80-25494

TEMPER (METALLURGY)
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[RR-79-8DB-HYTEM-R3] N80-25419

TEMPERATURE CONTROL
Heating and cooling system — for fatigue test specimens
[NASA-CASE-LAR-12280-1] N80-25693

TEMPERATURE DISTRIBUTION
Pressure and temperature fields associated with aero-optics tests — transonic wind tunnel tests
N80-25691
Computerized video densitometry method for rapid analysis of infrared photographic images — temperature distribution across a turbine blade
[NASA-TP-1686] N80-25835
Case studies on convective storms. Case study 5: First echo case, 12 July 1978
[PB80-143241] N80-26008

TEMPERATURE EFFECTS
Homogeneous production and removal of NOx from combustion exhaust gases — reaction rate over a temperature range
[ARI-RP-49] N80-25925

TEMPERATURE GRADIENTS
Correlation of nosetip boundary-layer transition data measured in ballistics-range experiments
[SAND-79-0649C] N80-25626
On the efficiency of meridional eddy transport processes during the major stratospheric warming of January 1977
[INPE-1687-RPE/118] N80-25968

TEMPERATURE MEASUREMENT
Use of a new analytical technique to determine heat input from inner surface temperatures measured on a hemispherical shell during a free flight experiment
[WSRL-0069-TR] N80-25587

TEMPERATURE PROFILES
A climatological study of the wind and temperature fields for the upper levels over South America
[INPE-1672-TDL/017] N80-25908

TENNESSEE
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740

TENSILE PROPERTIES
Tensile properties of irradiated and unirradiated welds of A533 steel plate and A508 forgings
[NUREG-CR-1158] N80-25710

TENSILE STRENGTH
Evaluation of the stress corrosion cracking resistance of several high strength low alloy steels
[NASA-TM-78276] N80-25413

TENSOR ANALYSIS
Mathematical methods in physics: Tensor analysis 3 — geodesy, Einstein's gravitational law, and the relativistic form of Maxwell equations
[INPE-1648-RPE/102-REV] N80-26088

TERMINAL AREA ENERGY MANAGEMENT
STS-1 operational flight profile. Volume 5: Descent, cycle 3
[NASA-TM-81077] N80-25371

TERMINAL GUIDANCE
MCC level C formulation requirements. Entry guidance and entry autopilot, optional TAEM targeting
[NASA-TM-81072] N80-25369
MCC level C formulation requirements. Shuttle TAEM targeting
[NASA-TM-80796] N80-25370

TERRAIN ANALYSIS
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland
N80-25747

TEST CHAMBERS
Design of viewing windows for controlled-atmosphere chambers
[ORNL/TM-6864] N80-25360
Criteria for controlled atmosphere chambers
[ORNL/TM-6865] N80-25361

TEST EQUIPMENT
Recommendations on policies and procedures for off-the-shelf electronic test equipment acquisition and support
[RTCA-307-79/SC134-69] N80-25535
Hot cell measuring and test equipment calibration control
[CONF-791103-73] N80-25842

TEST FACILITIES
Exploratory studies of the cruise performance of upper surface blown configurations. Experimental program: Test facilities, model design instrumentation, and low-speed, high-lift tests
[NASA-CR-3192] N80-25297
Water immersion facility Johnson Space Center
[GPO-54-508] N80-25348
Simulated hail test facility
[SAND-79-1114] N80-25349
Long tube heat exchanger: The facility and some preliminary tests on the down center/up annular flow configuration
[SAND-79-0823] N80-25823
Requirement definition and preliminary design of a photovoltaic central power station experimental test facility
[SAND-79-7022-VOL-1] N80-25870

TEXAS
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
Solar heating and cooling demonstration project at Radian Corporation, Austin, Texas
[NASA-CR-161442] N80-25784
Environmental assessment: Geothermal energy geopressure subprogram. DOE Sweet Lake no. 1, Cameron Parish, Louisiana
[DOE/EA-0065] N80-25829
Texas HIPLEX interim progress report — high plains cooperative program for weather modification
[PB80-133101] N80-26009
Texas HIPLEX, 1978: Field operations summary
[PB80-134471] N80-26010

THALLIUM
Journal of research of the National Bureau of Standards, volume 85, no. 1 — aqueous electrolytes, iridium-192 gamma ray sources, air density at differing altitude, and isotopic abundance of thallium
[PB80-146566] N80-25377

THEMATIC MAPPING
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment
[E80-10160] N80-25736
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's — Sierra Nevada Basins, California, Salt and Verde River Basins, Arizona, and the St. John River Basin, Maine and New Brunswick N80-25744
New goals for snow monitoring by satellite N80-25745
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747
Application of satellite data for snow mapping in Norway N80-25748
Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753
Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759

THEOREM PROVING
Some convexity properties of Euler's gamma function
[MC-ZW-105/78] N80-26099

THERMAL CONDUCTIVITY
Thermal conductivity measurements and molecular association in ethanol vapor
[CONF-791134-8] N80-25403
Heat conduction in partial vacuum
[ALO-5367-1] N80-25618

THERMAL EXPANSION
Particle simulation studies on behavior of laser-produced high-beta plasma in a magnetic field
[IPPJ-452] N80-25180

THERMAL FATIGUE
Thermal fatigue and oxidation data of oxide dispersion-strengthened alloys
[NASA-CR-159842] N80-25415
Thermal fatigue evaluation of solder alloys
[BOX-613-2341] N80-25429

THERMAL INSULATION
Selenide isotope generator for the Galileo mission. SiG thermal insulation tests evaluation
[TES-33009-50] N80-25834

THERMAL MAPPING
Geologic application of thermal-inertia mapping from satellite — Powder River Basin, Wyoming and Cabeza Prieta Arizona
[E80-10151] N80-25733
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10163] N80-25738
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
Overseas trip report, CV 990 underflight mission — Norwegian Sea, Greenland ice sheet, and Alaska
[NASA-TM-80662] N80-25763

THERMAL RESISTANCE
Development of nondestructive evaluation techniques for high-temperature ceramic heat exchange components
[ANL/MSD/FE-80-1] N80-25685

THERMAL SHOCK
Statistical treatment of heterogeneous chemical reaction in shock-initiated explosives
[UCID-18548] N80-25469

THERMAL STABILITY
Thermal-structural design study of an airframe-integrated Scramjet
[NASA-CR-159039] N80-25334
Bulk polymerization and stability of anaerobic adhesives
[MLM-2647] N80-25450
External fuel vaporization study, phase 1
[NASA-CR-159850] N80-25453

THERMAL STRESSES
Inelastic transient stress analysis for thermal and mechanical loading N80-25699
THERMIONIC POWER GENERATION
Thermoelectric generator testing and RTG degradation mechanisms evaluation
[SAN-0959-T2] N80-25809
THERMOCHEMISTRY
Thermochemical conversion of biomass: An overview of R and D activities sponsored by the biomass energy systems branch of DOE
[PNL-SA-8266] N80-25465
THERMODYNAMIC CYCLES
High temperature hydrogen cycles for solar heat sources
[LA-UR-80-194] N80-25817
An open cycle turbine solar thermal power system N80-26257
THERMODYNAMIC EFFICIENCY
Effects of microwaves on the performance of internal combustion engines
[SAN-1865-T1] N80-25672
Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161450] N80-25787
Solar energy system performance evaluation: Seasonal report for IBM system 1A, Huntsville, Alabama
[NASA-CR-161464] N80-25790
Solar energy system performance evaluation: Seasonal report for Solaron-Akron, Akron, Ohio
[NASA-CR-161465] N80-25791
Evaluation of residential building energy performance standards
[LBL-9816] N80-25849
THERMODYNAMIC PROPERTIES
Passive solar calculation methods
[DSE-5221-T1] N80-25798
Thermodynamic properties of extended Hubbard model with strong intraatomic attraction and arbitrary electron density
[INPE-1726-NTE/158-REV] N80-26124
Modified NASA-Lewis chemical equilibrium code for MHD applications
[NASA-TM-80903] N80-26162
THERMODYNAMICS
Advances in materials science
[UCRL-50058-79-3] N80-25376
Thermo-mechanical process for treatment of welds
[CONF-800316-2] N80-25423
THERMOELECTRIC GENERATORS
Thermoelectric generator testing and RTG degradation mechanisms evaluation
[SAN-0959-T2] N80-25809
THERMOPHYSICAL PROPERTIES
Thermophysical properties of inorganic polysulfides — applied to advanced batteries
[COO-10387-01] N80-25401
Thermophysical properties of sodium — liquid metal fast breeder reactors
[ANL/CEN/RSD-79-1] N80-25402
THERMOSPHERE
Effects of rocket exhaust products in the thermosphere and ionosphere
[LA-8233-MS] N80-25922
THICK FILMS
Hybrid microelectronic circuits, volume 2. Citations from the NTIS data base
[PB80-805922] N80-25582
THICKNESS
Viscous thin airfoil theory
[NASA-CR-163089] N80-25299
Selective paint development — solar energy absorbers
[ALO-4287-T2] N80-25448
THIN AIRFOILS
Viscous thin airfoil theory
[NASA-CR-163089] N80-25299
THIN FILMS
Electrothermal atomization in atomic absorption spectrometry: Fundamental causes of interference effects and a study of an exploding thin film atomizer N80-25385
Hybrid microelectronic circuits, volume 2. Citations from the NTIS data base
[PB80-805922] N80-25582
Theory of thin-film photovoltaics. Non-ideal diode factors
[DOE/ET-23103] N80-25840
Thin film polycrystalline silicon solar cells
[SAN-2207-3] N80-25844
Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T2] N80-25853
Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T3] N80-25854
Amorphous thin films for solar cell application
[DOE/ET-23040/1] N80-25882
Theory of thin-film photovoltaics
[DOE/ET-23103/4] N80-25885
Mechanical and dielectric properties of optical films
[UCRL-15098] N80-26144
Radiative and nonradiative recombination times in semiconducting films
[INPE-1679-RPE/112] N80-26179
THREE DIMENSIONAL FLOW
Near-wall similarity in two- and three-dimensional turbulent boundary layers N80-25578
THRUST AUGMENTATION
Performance prediction of power augmented electrothermal hydrazine thrusters
[TUM-LRT-KB-7B/1] N80-25375
THRUST CHAMBERS
Nitramine monopropellant deflagration and general nonsteady reacting rocket chamber flows N80-25373
THUNDERSTORMS
Vortex generation in a nested grid numerical thunderstorm model N80-25986
TIME DEPENDENCE
The rate (time)-dependent behavior of Ti-7Al-2Cb-1Ta titanium alloy at room temperature under quasistatic monotonic and cyclic loading
[AD-A082623] N80-25416
TIME MEASURING INSTRUMENTS
Research of an optimal configuration for high stability quartz oscillators on board aircraft and missiles N80-26258
TIME OF FLIGHT SPECTROMETERS
A study of reactions in a time-of-flight mass spectrometer N80-25387
TIME SERIES ANALYSIS
Development and verification of a model for predicting eutrophication trends in Czechoslovakia N80-25726
The modeling of nutrient exchange between sediment and water N80-25727
Time series forecasting and prediction. Citations from the NTIS data base
[PB80-804396] N80-26107
Continuous time series modeling with applications N80-26108
TIN ALLOYS
Thermal fatigue evaluation of solder alloys
[BDX-613-2341] N80-25429
TIRES
Evaluation of nondestructive inspection methods for aircraft tires
[AD-A082523] N80-25681
TIROS N SATELLITE
Data extraction and calibration of TIROS-N/NOAA radiometers
[PB80-150824] N80-25772
TIROS SATELLITES
Environmental satellite imagery
[PB80-153356] N80-26015
TISSUES (BIOLOGY)
Measurement of the mechanical impedance of human soft tissue in vivo N80-26031
TITAN 3 LAUNCH VEHICLE
Characterization of Titan 3-D acoustic pressure spectra by least-squares fit to theoretical model
[AD-A083021] N80-25361
TITANIUM ALLOYS
The high-temperature low cycle fatigue behavior of a near-alpha titanium alloy N80-25409
The rate (time)-dependent behavior of Ti-7Al-2Cb-1Ta titanium alloy at room temperature under quasistatic monotonic and cyclic loading
[AD-A082623] N80-25416
TOKAMAK DEVICES
Charge exchange measurements of ion behavior in the ISX Tokamak N80-26149
Negative shear ferpmak for stabilization of current disruptions in toroidal diacharge
[IPPJ-451] N80-26158
Spectroscopic study of turbulent heating in the high beta Tokamak, Torus 2
[COO-2456-70] N80-26164
STARFIRE: A commerical Tokamak reactor
[ANL/FPP/TM-125] N80-26171
TOLERANCES (PHYSIOLOGY)
Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307
TOPOGRAPHY
Topoclimatological and snowhydrological survey of Switzerland
[E80-10184] N80-25739
On the momentum transport by the stationary waves forced by the topography
[INPE-1720-RPE/125] N80-25990
TOROIDAL PLASMAS
Numerical simulation studies of toroidal pinches
[COO-2456-57] N80-26163
Observations of electron gyroharmonic waves and the structure of the Io torus — Jupiter 1 spacecraft radio astronomy experiment
[NASA-TM-80696] N80-26231
TORQUE
Reduction of unsteady wind torques on an open port airborne optical turret N80-25609
Measurement of external forces and torques on a large pointing system N80-25610
TORQUE CONVERTERS
Design study of toroidal traction CVT for electric vehicles
[NASA-CR-159803] N80-25981
TORSIONAL STRESS
Residual stress factors in torsional failure modes of inductionhardened steel axle shafts N80-25589
The torsional pendulum test for soils: A theoretical investigation
[PB80-154115] N80-25985
TOXICITY
Mammalian toxicological evaluation of TNT wastewaters. Volume 2: Acute and subacute mammalian toxicity of TNT and LAP mixture
[AD-A080957] N80-26034
TOXICOLOGY
Various techniques for evaluating cardiodynamic function using chronically instrumented canine models
[AD-A071284] N80-26035
TRACE CONTAMINANTS
A rapid analysis of surface waters by high pressure liquid chromatography
[PB80-132681] N80-25949
TRACKING (POSITION)
Development of a second-generation concentrating tracking solar collector
[ASE-4480] N80-25851
TRADEOFFS
Near hybrid passenger vehicle development program, phase 1. Appendices C and D, Volume 2
[NASA-CR-163331] N80-26302
TRAFFIC
Application of computer and interactive graphics — highway and railroad traffic flow
[PB80-147051] N80-26079
TRAINING AIRCRAFT
High bypass turbofan component development. Phase 1: Fan detail design
[AD-A082821] N80-25336
High bypass turbofan component development. Phase 2: Detailed design
[AD-A082753] N80-25341
TRAJECTORY ANALYSIS
Equations for determining aircraft motions for accident data
[NASA-TM-78809] N80-25306
Isentropic trajectories for derivation of objectively analyzed meteorological parameters
[PB80-143118] N80-26018
TRAJECTORY OPTIMIZATION
Suboptimal approximations for control in optimal dynamic programs — trajectory optimization for Earth-Mars or orbit transfer problems
[INPE-1676-TDL/019] N80-26086

TRANSFER ORBITS
Suboptimal approximations for control in optimal dynamic programs — trajectory optimization for Earth-Mars or orbit transfer problems
[INPE-1676-TDL/019] N80-26088

TRANSFORMATIONS (MATHEMATICS)
A medial axis transformation for grayscale pictures
[AD-A081347] N80-25636

TRANSIENT RESPONSE
Static and transient performance of YF-102 engine with up to 14 percent core airbleed for the quiet short-haul research aircraft
[NASA-TP-1692] N80-25339
Inelastic transient stress analysis for thermal and mechanical loading N80-25899

TRANSISTOR AMPLIFIERS
Transistor amplifiers, volume 2. Citations from the NTIS data base
[PB80-806037] N80-25586

TRANSMISSION LOSS
A theoretical and experimental investigation of the effects of the interaction between an acoustic field and cylindrical structure on sound transmission loss N80-26114

TRANSMISSIONS (MACHINE ELEMENTS)
Design study of toroidal traction CVT for electric vehicles
[NASA-CR-159803] N80-25861
Gas turbine engines and transmissions for bus demonstration programs
[COO-4967-05] N80-26215

TRANSMITTERS
Communication satellite technology: State of the art and development opportunities
[NASA-CR-159877] N80-25358
Minimum performance standards: Emergency locator transmitters: Automatic Fixed-ELT (AF), Automatic Portable-ELT (AP), Automatic Deployable-ELT (AD) operating on 121.5 and 243.0 megahertz
[RTCA/DO-168] N80-25511
Design and application of a mega-moment electromagnetic dipole source — to geothermal exploration surveys
[LBL-9920] N80-25549

TRANSONIC FLOW
Transonic flow field analysis for wing-fuselage configurations
[NASA-CR-3243] N80-25295
Transonic small perturbation equation applied to the solution of two-dimensional unsteady flows N80-25489

TRANSONIC FLUTTER
Experimental and analytical transonic flutter characteristics of a geared-elevator configuration
[NASA-TP-1666] N80-25321

TRANSPARENCE
Use of chlorophyll/Secchi Disk relationships — for predicting changes in water transparency due to varying plankton concentrations N80-25732

TRANSPORT PROPERTIES
On the efficiency of meridional eddy transport processes during the major stratospheric warming of January 1977
[INPE-1687-RPE/116] N80-25968
Proceedings of the Atmospheric Tracers and Tracer Application Workshop
[LA-8144-C] N80-25980
Transport and diffusion climatology of the US Atlantic and Gulf coasts
[BNL-26891] N80-26002
User's manual for biosphere and dose simulation program (BIODOSE)
[UCRL-15186] N80-26037

TRANSPORTATION ENERGY
Potential of energy farming for transport fuels in New Zealand
[NZERDC-46] N80-25456
Potential of energy farming for transport fuels in New Zealand, appendices
[NZERDC-46-APP] N80-25457
Developmental research program for clean industrial and transportation fuels from coal: Milestone report on comparison of catalysts, March 1979
[FE-2514-M4] N80-25471
Development of fuel cell technology for vehicular applications
[BNL-51047] N80-26218

TRAVELING WAVE TUBES
Diamond technology study — using diamonds in traveling wave tubes
[AD-A081928] N80-25545

TRAVELING WAVES
Effect of ion dynamics on relativistic nonlinear plasma oscillations
[INPE-1704-RPE/122-REV] N80-26151
Relativistic nonlinear cyclotron waves in a hot electron-ion plasma
[INPE-1723-RPE/128-REV] N80-26152

TREES (PLANTS)
Estimating long-term statistics for annual precipitation for six regions of the United States from tree-ring data
[UCRL-15162] N80-26006

TRIANGULATION
The combination of aerial and terrestrial photogrammetry in structural monitoring N80-25963

TRINITROTOLUENE
Mammalian toxicological evaluation of TNT wastewaters. Volume 2: Acute and subacute mammalian toxicity of TNT and LAP mixture
[AD-A080957] N80-26034

TRITIUM
Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-64] N80-25429
Summary of the fusion-fission hybrid fuel cycle analysis (tritiumless hybrids)
[UWFDM-337] N80-26139

TROPICAL REGIONS
Conceptual design and analysis of a 100 MWe distributed line focus solar central power plant
[SAN-2073-1] N80-25826
Geological and geotechnical investigation of sediment redistribution on the central equatorial Pacific seafloor N80-26021

TROPOSPHERIC SCATTERING
A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design — tropospheric scattering
[NASA-CR-163207] N80-25520

TUBE HEAT EXCHANGERS
Development of nondestructive evaluation techniques for high-temperature ceramic heat exchange components
[ANL/MSD/FE-80-1] N80-25685

TUNGSTEN ALLOYS
Tungsten and tungsten alloy powder metallurgy. Citations from the NTIS data base
[PB80-806011] N80-25434
Tungsten and tungsten alloy powder metallurgy. Citations from the Engineering Index data base
[PB80-806029] N80-25435

TURBIDITY
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta
[E80-10152] N80-25734

TURBINE BLADES
Computerized video densitometry method for rapid analysis of infrared photographic images — temperature distribution across a turbine blade
[NASA-TP-1686] N80-25635
Fly ash erosion in gas turbine materials N80-25659

TURBINES
Design and cold-air test of single-stage uncooled turbine with high work output
[NASA-TP-1680] N80-25337
Cold-air investigation of a 4 1/2 stage turbine with stage-loading factor of 4.66 and high specific work output. 2: Stage group performance
[NASA-TP-1688] N80-25338
Siting small wind turbines
[PNL-SA-7803] N80-25878
Vortex model of the Darrieus turbine: An analytical and experimental study
[SAND-79-7058] N80-25887
Aerodynamic interference between two Darrieus wind turbines
[SAND-79-1984C] N80-25897
Design and fabrication of a low-cost Darrieus vertical axis wind turbine system, phase 1
[ALO-4272] N80-25899

TURBOFAN ENGINES
High bypass turbofan component development. Phase 1: Fan detail design
[AD-A082821] N80-25336
Static and transient performance of YF-102 engine with up to 14 percent core airbleed for the quiet short-haul research aircraft
[NASA-TP-1692] N80-25339
High bypass turbofan component development. Phase 2: Detailed design
[AD-A082753] N80-25341

TURBOFANS
Diffusion bonded boron/aluminum spar-shell fan blade
[NASA-CR-159571] N80-25382

TURBOGENERATORS
An open cycle turbine solar thermal power system N80-26257

TURBOMACHINERY
A new approach in turbomachinery flow analysis using the finite element method N80-25331

TURBULENCE
The measurement of turbulence with the burst-type laser Doppler anemometer: Errors and correction methods N80-25589
Proceedings of the Aero-Optics Symposium on Electromagnetic Wave Propagation from Aircraft
[NASA-CP-2121] N80-25588

TURBULENT BOUNDARY LAYER
Near-wall similarity in two- and three-dimensional turbulent boundary layers N80-25578
Prediction of optical propagation losses through turbulent boundary/shear layers N80-25595
On optical imaging through aircraft turbulent boundary layers
[AMP-334] N80-25596
Second moments of optical degradation due to a thin turbulent layer N80-25597
Lear jet boundary layer/shear layer laser propagation experiments N80-25602
Optical measurements of degradation in aircraft boundary layers N80-25603
Cycle II.5 aircraft aero-optical turbulent boundary-layer/shear-layer measurements N80-25605
Calculation of skin-friction coefficients for low Reynolds number turbulent boundary layer flows
[NASA-CR-163082] N80-25624

TURBULENT FLOW
Motion of a sphere in the presence of a plane interface, 1. Modeling of non-isothermal turbulent flows, 2 N80-25582
Turbulent two-dimensional jet flow and its effect on laser beam degradation N80-25589
Finite element simulation of simple three-dimensional fully cavitating flows
[AD-A082823] N80-25618
Simulation of chemical reaction in a turbulent flow
[ISM-253] N80-25620
Convective heat transfer in MHD channels and its influence on channel performance
[CONF-800104-5] N80-26186
Laminar and turbulent flow solutions with radiation and ablation injection for Jovian entry — radiative heating rates for the Galileo probe
[NASA-CR-163215] N80-26238

TURBULENT WAKES
An interaction algorithm for prediction of mean and fluctuating velocities in two-dimensional aerodynamic wake flows
[NASA-CR-3301] N80-25298

TWO DIMENSIONAL FLOW
An interaction algorithm for prediction of mean and fluctuating velocities in two-dimensional aerodynamic wake flows
[NASA-CR-3301] N80-25298
La Recherche Aerospatiale, Bimonthly Bulletin no. 1979-5
[ESA-TT-613] N80-25485
Resolution of Navier-Stokes equations by a space-time pseudo-spectral method N80-25487
Transonic small perturbation equation applied to the solution of two-dimensional unsteady flows N80-25489
An approximation and an associated numerical method for two-dimensional steady supersonic gas dynamics N80-25567

TWO DIMENSIONAL JETS
Turbulent two-dimensional jet flow and its effect on laser beam degradation N80-25589

TWO PHASE FLOW
Local drag laws in dispersed two-phase flow
[NUREG-CR-1230] N80-25631

U

ULTRAHIGH FREQUENCIES
Shuttle Ku-band and S-band communications implementation study
[NASA-CR-160862] N80-25522
The 30/20 GHZ net market assessment
[NASA-CR-159837] N80-26109
ULTRASONIC TESTS
Development of nondestructive evaluation techniques for high-temperature ceramic heat exchange components
[ANL/MSD/FE-80-1] N80-25885
Electron-photon interactions in piezoelectric semiconductors for the phase insensitive detection of ultrasound N80-26113
UNCONTROLLED REENTRY (SPACECRAFT)
User's guide for Skylab dynamics program, SKYDYN
[NASA-TM-78279] N80-26056
UNDERCARRIAGES
Aircraft dynamic response to damaged runways
[AGARD-R-685] N80-25325
Parameters affecting aircraft performance on runways in bad condition N80-25328
UNDERWATER TESTS
Water immersion facility Johnson Space Center
[GPO-54-508] N80-25348
UNITED NATIONS
Agreement governing the activities of states on the Moon and other celestial bodies, parts 1 and 2
[GPO-59-896] N80-26199
UNITED STATES OF AMERICA
Metrication in the United States. Citations from the NTIS data base
[PB80-806838] N80-25497
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejobs and South Fork River basins N80-25752
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755
Variability of solar radiation at four selected stations in the United States
[COO-4521-1] N80-25979
UNIVERSITIES
Community colleges and appropriate technology
[PB80-131634] N80-26220
UNSTEADY FLOW
Unsteady pressure measurements at stall and buffeting
[DFVLR-MITT-79-09] N80-25300
Experimental determination of unsteady blade element aerodynamics in cascades. Volume 1: Torsion mode cascade
[NASA-CR-159831] N80-25335
Unsteady aerothermodynamics modeling N80-25488
Transonic small perturbation equation applied to the solution of two-dimensional unsteady flows N80-25489
Droplet drag and breakup in shock-wave induced unsteady flows N80-25585
UPPER ATMOSPHERE
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083019] N80-25977
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083022] N80-25978
A climatological study of the wind and temperature fields for the upper levels over South America
[INPE-1672-TDL/017] N80-25998
UPPER SURFACE BLOWN FLAPS
Exploratory studies of the cruise performance of upper surface blown configurations. Experimental program: Test facilities, model design instrumentation, and lowspeed, high-lift tests
[NASA-CR-3192] N80-25297
UPWELLING WATER
Coastal upwelling ecosystems analysis. Physical dynamics of the coastal upwelling frontal zone off Oregon
[PB80-139843] N80-26024
URBAN DEVELOPMENT
Contributions of urban land use to stream water quality
[PB80-151176] N80-25942
URBAN RESEARCH
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
Application of HCMM satellite data to the study of urban heating patterns — St. Louis, Missouri; Houston, Texas; Los Angeles, California; Washington, D.C.; Clarksville, Tennessee
[E80-10165] N80-25740
URBAN TRANSPORTATION
Near hybrid passenger vehicle development program, phase 1. Appendices A and B. Mission analysis and performance specification studies report, volume 1
[NASA-CR-163330] N80-26201
Near hybrid passenger vehicle development program, phase 1. Appendices C and D, Volume 2
[NASA-CR-163331] N80-26202
Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210
USER MANUALS (COMPUTER PROGRAMS)
Users manual: Secondary data reduction programs for the Eclipse S-200/230 shock and vibration measurement systems
[SAND-79-8085] N80-25708
The RSZ BASIC programming language manual
[NASA-TM-80690] N80-26053
User's guide for Skylab dynamics program, SKYDYN
[NASA-TM-78279] N80-26056
Computer program documentation modified version of the JA70 aerodynamic heating computer program H800 (MINIVER with a DISSPLA plot package
[NASA-CR-160695] N80-26064
User/programmer guide to UCMD 64: Dumping drawing files to tape
[SAND-80-0156] N80-26076
Modified NASA-Lewis chemical equilibrium code for MHD applications
[NASA-TM-80903] N80-26182
UTAH
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756
UTILITIES
Reliability, energy and cost effects of wind integration with conventional electrical generating systems
[CONF-791204-32] N80-25894
Clearinghouse and information resources offering utility-related products and services
[DOE/RG-10019/T1] N80-26196

V

VACILLATION
Baroclinic wave vacillations N80-25960
VACUUM TUBES
Solair heater program: Solair applications study
[COO-2705-3] N80-25813
VALLEYS
Topoclimatological and snowhydrological survey of Switzerland
[E80-10164] N80-25739
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
VAPOR DEPOSITION
Materials Coating Techniques
[AGARD-LS-106] N80-25499
High rate physical vapor deposition processes N80-25500
Plasma aided techniques N80-25501
Techniques of chemical vapor deposition N80-25502
Overlay coatings for gas turbine airfoils N80-25506
Wear resistant coatings made by chemical vapour deposition N80-25508
Applications of physical vapor deposition processes N80-25509
VAPOR PHASES
Techniques of chemical vapor deposition N80-25502
Gallium arsenide epitaxial growth, volume 2. Citations from the NTIS data base
[PB80-805583] N80-26189
VARIABLE STARS
An analysis of the atmosphere of the RV Tauri star AC Herculis N80-26226
VARIATIONAL PRINCIPLES
Variational formulation of the plate equilibrium problem. Application to isoparametric finite elements of plates, part 1 N80-26259
VEGETATION
Application of digital analysis of MSS data to agro-environmental studies — Kansas, Minnesota, and Hartford, Connecticut
[E80-10161] N80-25737
HCMM: Soil moisture in relation to geologic structure and lithology, northern California — Sacramento Valley, California
[E80-10163] N80-25738
VELOCITY MEASUREMENT
Simulated hail test facility
[SAND-79-1114] N80-25349
The measurement of turbulence with the burst-type laser Doppler anemometer: Errors and correction methods N80-25569
Feasibility studies for light scattering experiments to determine the velocity relaxation of small particles in a fluid
[NASA-CR-163214] N80-25586
Summary of all cycle II.5 shear and boundary layer measurements, aerodynamics N80-25604
VENTURI TUBES
Dust control for a Borer-type continuous miner using a venturi scrubber on a transfer car
[PB80-144850] N80-25773
VERTICAL DISTRIBUTION
Spaced lidar and nightglow observations of an atmospheric sodium enhancement
[INPE-1675-RPE/110] N80-25974
VERTICAL ORIENTATION
Aerodynamic interference between two Darrieus wind turbines
[SAND-79-1984C] N80-25897
Design and fabrication of a low-cost Darrieus vertical axis wind turbine system, phase 1
[ALO-4272] N80-25899
VERTICAL TAKEOFF AIRCRAFT
A decision by the Secretary of Defense is needed on the AV-8B aircraft program
[PB80-143209] N80-25291
VERY HIGH FREQUENCIES
VHF air-ground communication technology and spectrum utilization
[RTCA/DO-169] N80-25510
VHF air-ground technology and spectrum utilization
[RTCA-155-79/SC140-17-REV] N80-25513
VHF OMNIRANGE NAVIGATION
Navaids calibration evaluation with a computer-controlled avionics-data acquisition system N80-25287
VIBRATION
Summary of aerodynamic vibration effects on ALL turret N80-25807
Vibration of cylindrical shells, with and without ring stiffening
[AD-A082524] N80-25701
VIBRATION EFFECTS
Aircraft sonic boom: Effects on buildings. Citations from the NTIS data base
[PB80-806334] N80-25304
VIBRATION MEASUREMENT
Users manual: Secondary data reduction programs for the Eclipse S-200/230 shock and vibration measurement systems
[SAND-79-8085] N80-25708
VIBRATION TESTS
Identification of the elastic characteristics of composite materials by means of vibration tests and a model of discrete conservative calculation N80-26261

VIBRATIONAL SPECTRA
In-depth analysis of conformational changes in small ring molecules [N80-26122]

VIKING MARS PROGRAM
Images of Mars: The Viking extended mission [NASA-SP-444] N80-26239
Viking orbiter stereo imaging catalog [NASA-CR-3277] N80-26340

VISCOPLASTICITY
The concept of effective stress applied to elasticity and to viscoplasticity in the presence of anisotropic damage [RAE-LIB-TRANS-2039] N80-25696
Mechanical modeling of microstructural instabilities in cyclic viscoplasticity at variable temperatures [ESA-TT-611] N80-25718

VISCOSITY
Viscous thin airfoil theory [NASA-CR-163089] N80-25299
Viscosity of He3 in superfluid and Fermi liquid regimes N80-25482

VISCOUS DRAG
Local drag laws in dispersed two-phase flow [NUREG-CR-1230] N80-25631

VISCOUS FLOW
Hypersonic slip-flow around slender elliptic cones at a slight angle of attack [DFVLR-FB-79-21] N80-25301

VISUAL PERCEPTION
Head-up transition behavior of pilots during simulated low-visibility approaches [NASA-TP-1618] N80-26039

VOICE COMMUNICATION
Non-Gaussian characteristics of the FDM-FM satellite baseband voice channel N80-25516

VOLT-AMPERE CHARACTERISTICS
Surface voltammetry and coulometry of solid electrodes N80-25388

VOLTMETERS
Semiautomated calibration: A case study [SAND-79-2004C] N80-25643

VORTICES
Aircraft wake vortices. Citations from the NTIS data base [PB80-805886] N80-25303
Vortex model of the Darrieus turbine: An analytical and experimental study [SAND-79-7059] N80-25887
Vortex generation in a nested grid numerical thunderstorm model N80-25986

VOYAGER 1 SPACECRAFT
Thermoelectric generator testing and RTG degradation mechanisms evaluation [SAN-0958-T2] N80-25809
Observations of electron gyroharmonic waves and the structure of the Io torus — jupiter 1 spacecraft radio astronomy experiment [NASA-TM-80696] N80-26231

VOYAGER 2 SPACECRAFT
Thermoelectric generator testing and RTG degradation mechanisms evaluation [SAN-0958-T2] N80-25809

W

WAFERS
Analysis and evaluation in the production process and equipment area of the low-cost solar array project [NASA-CR-163208] N80-25782

WALL FLOW
Near-wall similarity in two- and three-dimensional turbulent boundary layers N80-25578

WASHINGTON
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25758

WASTE DISPOSAL
Research and development activities: High-level waste immobilization program [PNL-3050-1] N80-26131
Development and characterization of solidified forms for high level wastes [PNL-3080] N80-26132
Geoscience data base handbook for modeling a nuclear waste repository, volume 1 — salt bed and dome repositories [NUREG-CR-0912-VOL-1] N80-26133
Nuclear waste management: A perspective [CONF-800117-1] N80-26135

WASTE ENERGY UTILIZATION
Beneficial use of rejected heat from electric power plants [COO-4531-6] N80-25841

WASTE TREATMENT
Research and development activities: High-level waste immobilization program [PNL-3050-1] N80-26131

WASTE UTILIZATION
Biosources digest, a journal on biomass utilization, volume 1, no. 1 [PB80-140973] N80-25908
Biosources digest: A journal on biomass utilization, volume 1, no. 4 [PB80-140981] N80-25909

WATER
Feasibility study of using a coal/water oil emulsion as a clean liquid fuel [FE-2437-T1-ADD] N80-25463
Biological and synthetic systems for production of hydrogen from water — using hydrogenase with algae, chloroplasts, or synthetic catalysts [PB80-146269] N80-25480
Solar energy system performance evaluation. Albuquerque Western no. 1, Albuquerque, New Mexico [SOLAR/1011-79/14] N80-25816
Hybrid thermal storage with water [ESG-DOE-13259] N80-25881
Liquid water measurements in high elevation continental cumuli [PB80-143928] N80-26017

WATER BALANCE
New goals for snow monitoring by satellite N80-25745
A hydrometeorological model for medium sized hydrographic basins [INPE-1729-TDL/025] N80-25897

WATER CIRCULATION
Two examples of the use of hydrodynamic models in ecological studies — Lake Huron and Lake Erie water circulation N80-25724
The modeling of nutrient exchange between sediment and water N80-25727

WATER COLOR
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta [E80-10152] N80-25734

WATER DEPTH
Use of chlorophyll/Secchi Disk relationships — for predicting changes in water transparency due to varying plankton concentrations N80-25732

WATER HEATING
Solar heating and hot water system installed at Municipal Building complex, Abbeville, South Carolina [NASA-CR-161443] N80-25788
Solar energy system performance evaluation: Seasonal report for IBM system 1A, Huntsville, Alabama [NASA-CR-161464] N80-25790
Solar energy system performance evaluation: Seasonal report for Solaron-Akron, Akron, Ohio [NASA-CR-161465] N80-25791
Solar project description for A-Frame Industries' single family residence: Kaneohe, Hawaii [SOLAR/1010-79/50] N80-25818
Comparative performance of two types of evacuated tubular solar collectors in a residential heating and cooling system [COO-2577-19] N80-25864
Analysis of community solar systems for combined space and domestic hot water heating using annual cycle thermal energy storage [SERI/TP-355-570] N80-25900
SAGE, Solar Assisted Gas Energy [PB80-153836] N80-25907
Energy test method development for electric heat pump water heaters [PB80-145212] N80-25911

WATER INJECTION
Performance evaluation of Magma Power company's reinjection well no. 46-7 at the East Mesa KGRA, California [SAND-79-7127] N80-25883

WATER MANAGEMENT
The prediction of solutions to management and engineering problems related to the eutrophication of bodies of water N80-25723
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25758
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759

WATER POLLUTION
Methods of evaluation of potentially hazardous organics in water [PB80-135122] N80-25408
A rapid analysis of surface waters by high pressure liquid chromatography [PB80-132691] N80-25949

WATER QUALITY
Hydrological and ecological models of shallow lakes and reservoirs [IIASA-CP-78-14] N80-25720
Evaluation of available phosphorus models — phosphorus loading in lakes N80-25729
Theoretical investigations into the development of an intensively used shallow lake with a river flowing into it N80-25730
Eutrophication modeling efforts for Lake Balaton — Hungary N80-25731
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta [E80-10152] N80-25734
Contributions of urban land use to stream water quality [PB80-151178] N80-25942

WATER RESOURCES
Beneficial use of rejected heat from electric power plants [COO-4531-6] N80-25841

WATER RUNOFF
Operational Applications of Satellite Snowcover Observations [E80-10157] N80-25742
New goals for snow monitoring by satellite N80-25745
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747
Application of satellite data for snow mapping in Norway N80-25748
Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejos and South Fork River basins N80-25752
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753
Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755
Snow extent measurements from geostationary satellites using an interactive computer system — Salt and Verde River Basins, Arizona N80-25757
An all-digital approach to snow mapping using geostationary satellite data — Sierra Nevada Test Site: Sacramento, Feather, Tahoe-Truckee, Carson, Yuba, Mokelumne, Stanislaus, and Walker River Basins N80-25758

Determination of selected hydraulic properties of subarctic soils
[PB80-150956] N80-25983

WATER TREATMENT
Performance evaluation of Magma Power company's reinjection well no. 46-7 at the East Mesa KGRA, California
[SAND-79-7127] N80-25863

WATER VAPOR
Models of atmospheric water vapor budget for the Texas HIPLEX area
[PB80-147986] N80-26013

WATERSHEDS
Eutrophication modeling efforts for Lake Balaton — Hungary N80-25731
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743
Digital mapping of mountain snowcover under European conditions — Dischma Valley and Landwasser, Davos-Grisons, Switzerland N80-25747
Application of satellite data for snow mapping in Norway N80-25748
Satellite snowcover and runoff monitoring in central Arizona — Salt River Project: Salt-Verde Watershed N80-25749
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado — Conejos and South Fork River basins N80-25752
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California — Kings, Kern and Kaweah River Basins N80-25753
Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada — Kings River Basin N80-25754
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755

WAVE AMPLIFICATION
Baroclinic wave vacillations N80-25960

WAVE DEGRADATION
Turbulent two-dimensional jet flow and its effect on laser beam degradation N80-25589
Prediction of optical propagation losses through turbulent boundary/shear layers N80-25595

WAVE EQUATIONS
The inverse scattering problem for perturbed wave equations N80-25515
Study of nonlinear waves described by the cubic Schroedinger equation
[UCRL-52920] N80-25530

WAVE FRONTS
Digital wavefront reconstruction for acoustical applications N80-26112

WAVE PROPAGATION
A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design — tropospheric scattering
[NASA-CR-163207] N80-25520
Wave propagation through axially-symmetric dielectric shells
[AD-A082378] N80-25524
ATS-6 measurements during AVEFRIA
[AD-A082192] N80-25525
Proceedings of the Aero-Optics Symposium on Electromagnetic Wave Propagation from Aircraft
[NASA-CP-2121] N80-25588
Line spread instrumentation for propagation measurements N80-25582
Aero-optical characterization of aircraft optical turrets by holography, interferometry and shadowgraph N80-25593
Prediction of optical propagation losses through turbulent boundary/shear layers N80-25595

WAVE SCATTERING
The inverse scattering problem for perturbed wave equations N80-25515

WAVELENGTHS
Elastic-wave radiation from spherical sources — Seismic radiation source
[UCRL-52867] N80-25529
Active/passive long wavelength infrared (LWIR) laser guidance
[AD-A082509] N80-25647

WEAPON SYSTEMS
F/A-18 naval strike fighter: Its effectiveness is uncertain
[PB80-143225] N80-25324

WEAR
The testing and application of machinability criteria
[CSIR-TRANS-1457] N80-25483

WEAR INHIBITORS
Applications of sprayed coatings N80-25507
Wear resistant coatings made by chemical vapour deposition N80-25508

WEATHER FORECASTING
Hurricanes forecasting, modification, and research. Citations from the NTIS data base
[PB80-804255] N80-26020

WEATHER MODIFICATION
A model for modification of the cloud-topped marine boundary layer during cold air outbreak N80-25989
The Precipitation Enhancement Project (PEP) — a report on the training workshop on weather modification for meteorologists held in Villadolid, Spain, March 1979
[DFVLR-MITT-79-12] N80-26006
Texas HIPLEX interim progress report — high plains cooperative program for weather modification
[PB80-133101] N80-26009
Texas HIPLEX, 1979: Field operations summary
[PB80-134471] N80-26010

WELDED JOINTS
Fatigue of weldments in nuclear pressure vessels and piping
[NUREG-CR-1351] N80-25706
Tensile properties of irradiated and unirradiated welds of A533 steel plate and A508 forgings
[NUREG-CR-1158] N80-25710
Measured residual stresses in type 304 stainless steel piping butt weldments
[DOE/TIC-11126] N80-25712

WELDED STRUCTURES
Thermo-mechanical process for treatment of welds
[CONF-800316-2] N80-25423

WELLS
Performance evaluation of Magma Power company's reinjection well no. 46-7 at the East Mesa KGRA, California
[SAND-79-7127] N80-25863

WIND (METEOROLOGY)
Siting small wind turbines
[PNL-SA-7803] N80-25878
A regional surface wind model for mountainous coastal areas
[PB80-146152] N80-26014

WIND EFFECTS
Reduction of unsteady wind torques on an open port airborne optical turret N80-25609

WIND PROFILES
Examination of the empirical flux-profile models in the atmospheric surface boundary layer
[INPE-1747-RPE/140] N80-25971
Vector wind profile gust model
[NASA-CR-161474] N80-25992
Vector wind profile gust model
[NASA-CR-161475] N80-25993
A climatological study of the wind and temperature fields for the upper levels over South America
[INPE-1672-TDL/017] N80-25998

WIND TUNNEL TESTS
Development and validation of a combined rotor fuselage induced flow field computational method — Langley V/STOL tunnel
[NASA-TP-1656] N80-25296
Large-scale wind-tunnel tests of inverting flaps on a STOL utility aircraft model
[NASA-TP-1696] N80-25318
Orbiter/shuttle carrier aircraft separation: Wind tunnel, simulation, and flight test overview and results
[NASA-TM-58223] N80-25372
Overview of 6- X 6-foot wind tunnel aero-optics tests — transonic wind tunnel tests N80-25590
Pressure and temperature fields associated with aero-optics tests — transonic wind tunnel tests N80-25591
Unsteady density and velocity measurements in the 6 foot x 6 foot wind tunnel N80-25594

WINDOWS
Design of viewing windows for controlled-atmosphere chambers
[ORNL/TM-6864] N80-25350

WINDPOWER UTILIZATION
Wind energy applications in agriculture: Executive summary
[DOE/SEA-1109-20401-79/2] N80-25807
Design study and economic assessment of multi-unit offshore wind energy conversion systems applications. Volume 4: Meteorological and oceanographic surveys
[WASH-2330-78/4-VOL-4] N80-25836
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 3: System analysis
[WASH-2330-78/4-VOL-3] N80-25837
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 2: Apparatus designs and costs
[WASH-2330-78/4-VOL-2] N80-25838
Siting small wind turbines
[PNL-SA-7803] N80-25878
New developments in wind systems technology
[RFP-3000] N80-25888
Technical and management support for the development of small wind systems
[RFP-2974/3533-79-2] N80-25889
Reliability, energy and cost effects of wind integration with conventional electrical generating systems
[CONF-791204-32] N80-25894
Environmental assessment of small wind systems
[SERI/PR-354-420] N80-25928

WINDPOWERED GENERATORS
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 3: System analysis
[WASH-2330-78/4-VOL-3] N80-25837
New developments in wind systems technology
[RFP-3000] N80-25888
Aerodynamic interference between two Darrieus wind turbines
[SAND-79-1984C] N80-25897
Design and fabrication of a low-cost Darrieus vertical axis wind turbine system, phase 1
[ALO-4272] N80-25899

WINGS
Transonic flow field analysis for wing-fuselage configurations
[NASA-CR-3243] N80-25295

WIRING
Improving delamination resistance of multilayer printed wiring boards
[BDX-613-2413] N80-25548

WISCONSIN
Solar energy performance evaluation. Zien Mechanical Contractors no. 1: Single-family residence, Milwaukee, Wisconsin
[SOLAR/1057-79/14] N80-25820

WORKING FLUIDS
Superior heat transfer fluids for solar heating and cooling applications
[ALO-35356-1] N80-25815

WYOMING
Geologic application of thermal-inertia mapping from satellite — Powder River Basin, Wyoming and Cabeza Prieta Arizona
[E80-10151] N80-25733
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest — Upper Snake, Boise, Dworshak, Libby and Hungry Horse River Basins N80-25750
Discharge forecasts in mountain basins based on satellite snow cover mapping — Dinwoody Creek Basin, Wyoming and the Dischma Basin, Switzerland N80-25755
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) — Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming N80-25756

X

X RAY ASTRONOMY
The 1979 X-ray outburst of Cen X-4
[NASA-TM-80694] N80-26235
Is the remnant of SN1006 crab-like?
[NASA-TM-80689] N80-26251
X RAY IMAGERY
Image processing applications in NDE — X-ray inspection of microballoon laser targets
[LA-UR-80-172] N80-25686
X RAY SPECTRA
Rocket observations of solar radiation during the eclipse of 26 February 1979
[NASA-CR-163211] N80-26242
X RAYS
X-rays from active galactic nuclei: Emission mechanisms and interaction with ambient media
N80-25247

Y

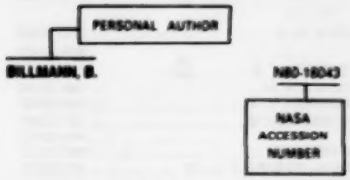
YAG LASERS
High repetition rate electro-optic Q-switching of Nd(3+):YAG lasers showing strong optical birefringence
[IPF-79-6] N80-25656
YAGI ANTENNAS
Loop yagi array antennas N80-25517
YTTRIUM
Nuclear magnetic resonance wide-line study of hydrogen in the yttrium-yttrium dihydride system
[IS-T-977] N80-25136
YTTRIUM ALLOYS
Superconductivity in the lanthanum-yttrium-manganese alloy system
[IS-T-995] N80-25554

Z

ZINC COMPOUNDS
Photoelectronic properties of zinc phosphide crystals, films and heterojunctions
[SU-DSE-4042-T18] N80-25547
ZIRCONIUM OXIDES
Single crystal growth of zirconia utilizing a skull melting technique
[AD-A082323] N80-26183
ZODIACAL LIGHT
Background sky brightness measurements for application to space surveillance systems — zodiacal light and interplanetary dust
[AD-A081881] N80-26237

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this Index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABBINK, F. J. N80-25257
ABDU, M. A. N80-25972
ACCIAN, T. N80-25947
ACQUISTA, C. N80-25588
ACZEL, T. N80-25450
ADAMS, R. P. N80-26030
ADAMSKI, J. A. N80-26183
ADELFANG, S. I. N80-25992
N80-25993
AGGARWAL, B. B. N80-25857
AGRAWAL, V. K. N80-26177
AHLUWALIA, R. K. N80-26186
AIZAWA, M. N80-26180
AKERS, F. I. N80-25702
N80-25703
ALBRINCK, D. N80-25954
ALEXANDER, J. K. N80-26231
ALEXANDER, W. O. N80-26010
ALLEN, E. L. N80-25804
AMMON, R. L. N80-25666
ANASTASI, J. A. N80-25797
ANDERSEN, T. N80-25748
ANDERSON, A. C. N80-26129
ANDERSON, D. L. N80-26136
ANDERSON, J. A. N80-25935
ANDERSON, J. H. N80-25850
ANDERSON, J. J. N80-26102
ANDERSON, K. N80-25892
ANDERSON, T. C. N80-26200
ANDERSON, W. W. N80-25982
ANDREWS, J. W. N80-25896
ANDREWS, L. N80-25812
ANGELINI, J. J. N80-25489
ANTOON, M. K., JR. N80-25378
ANTRIM, W. D., JR. N80-25851
ARCHER, N. J. N80-25502
N80-25508
ARMSTRONG, R. W. N80-25853
N80-25854
ARNTS, R. R. N80-25945
ASHCROFT, H. W. N80-26143
ASTON, G. N80-26181
ATHANASSIADIS, A. N80-25716
ATKINSON, R. N80-25939
AUSTIN, A. E. N80-25871
AZEVEDO, S. G. N80-26106

B

BACH, R. E., JR. N80-25306
BACK, K. C. N80-26035
BADER, S. D. N80-26187
BAGOTSKII, S. V. N80-25723
BAHR, D. W. N80-25944
BAILEY, W. H., JR. N80-25592
BAIRD, S. R. N80-26226
BAKER, A. N80-25571
BAKER, A. J. N80-25296
BAKER, L. N80-25854
BAKER, N. R. N80-25890
BAKOW, L. N80-25418
BALL, S. J. N80-25830
BALLOU, S. W. N80-25827
BANIA, P. J. N80-25409
BARCLAY, J. A. N80-25492
BARKER, C. R. N80-25766
BARLIER, F. N80-26256
BARNA, P. S. N80-25330
BARNES, J. C. N80-25743
BARNETT, W. J. N80-25825
BARR, P. K. N80-25624
BARR, S. N80-25980
BARROW, G. N80-25483
BARSCHDORF, D. N80-25262
BARTSCH, O. N80-25328
BASCOM, W. D. N80-26253
BASKHARONE, E. A. N80-25331
BATISTA, I. S. N80-25872
BATISTA, P. P. N80-25874
BAUDIN, G. N80-25490
BAUER, K. N80-25730
BAUMAN, J. E. N80-25397
BAUMGARDNER, R. E. N80-25953
N80-25955
BAYLIN, F. N80-25900
BEACHLEY, N. H. N80-25668
BEALL, J. H. N80-26234
BEARDSLEY, R. C. N80-26025
BEAUSSIER, J. N80-25258
BECKER, R. H. N80-26251
BEDAIR, S. M. N80-25912
BEHBAHANI, A. I. N80-25571
BEHLKE, R. F. N80-25333
BEHNING, F. P. N80-25337
N80-25338
BEIER, B. F. N80-25480
BEKOFSKE, K. L. N80-25622
BELCHER, R. A. N80-25518
BELL, D. D. N80-25661
BEN-REUVEN, M. N80-25373
BENDA, B. J. N80-25714
BENDER, C. M. N80-26191
BENECKE, U. N80-25298
BENEMANN, J. R. N80-25852
BENGTSSON, H. N80-25895
BENSON, P. A. N80-25460
BERG, L. N80-25398
BERNARD, A. N80-26258
BESSLING, H. N80-25352
BIGGS, F. N80-26075
BIGOT, P. C. N80-25459
BINKLEY, J. S. N80-26120
BIRMINGHAM, T. J. N80-26231
BLAIR, W. P. N80-26228
BLAISDELL, G. A. N80-25800
BLANDER, M. N80-25403
BLASIUS, K. R. N80-26240
BLECHMAN, J. B. N80-25986
BLISS, H. M. N80-26242
BLOOMFIELD, P. N80-26111
BLOOMSTER, C. H. N80-25865
BLUE, M. D. N80-25847
BLUMENTHAL, D. L. N80-25835
BOEER, K. W. N80-25840
N80-25885
BOGAR, G. P. N80-26037
BOGDAN, V. M. N80-26087
BOLDT, E. A. N80-26251
BOLING, J. K., JR. N80-25777
BOLIS, T. S. N80-25884
BONATTI, J. P. N80-25968
N80-25976
BOND, V. B. N80-26087
BONNER, J. N80-25775
BONNER, W. F. N80-26131
BOOKER, B. L. P. N80-25706
BOOKER, J. R. N80-26100
BOOKER, M. K. N80-25706
BOONE, D. H. N80-25506
BOPPE, C. W. N80-25295
BORGES, H. G. V. S. N80-26058
N80-26061
BOROWSKI, R. N80-25326
BOUTTES, J. N80-26256
BOVILLE, B. A. N80-25960
BOWLEY, C. J. N80-25743
BOWMAN, M. G. N80-25617
BOWRING, B. R. N80-25776
BOYLE, R. J. N80-26012
BRADEN, J. A. N80-25297
BRADZIL, J. F., JR. N80-25396
BRAIN, C. N80-25327
BRAITINGER, M. N80-25375
BRANCH, C. G. N80-25636
BRASKI, D. N. N80-25424
BREED, D. W. N80-26007
N80-26017
BRODIE, R. W. N80-25418
BROOKMAN, E. T. N80-25495
BROOKS, F. F. N80-25957
BROOKY, J. D. N80-25339
BROOMAN, E. W. N80-25871
BROWN, A. J. N80-25753
BROWN, K. C. N80-25839
BROWN, R. J. N80-26020
BROWN, W. A. H. N80-25458
N80-25457
BROWN, W. S. N80-26025
BRUCKBAUER, J. J. N80-25889
BRUHWEILER, F. N80-26238
BRUMMER, S. B. N80-25891
BRUNS, R. N80-26073
BRUSAGLINO, G. N80-26211
BUBE, R. H. N80-25547
BUBLITZ, P. N80-25300
BUCHHAVE, P. N80-25569
BUEHLMEIER, J. N80-25700
BUEHRING, W. A. N80-25894
BUELL, D. A. N80-25590
BUHRMAN, R. A. N80-26143
BUNGARNER, J. E. N80-25953
BUNSHAH, R. F. N80-25500
N80-25509
BURDGES, K. P. N80-25297
BURKHALTER, J. F. N80-26123
BURNS, A. A. N80-25525
BUROLLA, V. P. N80-25856
BURSIK, J. W. N80-25615
BUSH, T. W. N80-25459
BUSSARD, R. W. N80-26229
BUSSE, L. J. N80-26113
BUTLER, G. W. N80-25848
BUZENBERG, R. J. N80-25807
BYKER, H. J. N80-25871
BYRNE, C. E. N80-26067
BYRNE, D. J. N80-26067
BYRNE, J. C. N80-26067

C

CAILLETAUD, G. N80-25718
CALDWELL, L. R. N80-25326
CALFO, F. D. N80-25835
CALLENDER, E. D. N80-26057
CALVO, R. N80-25666

CANAL, E., JR. N80-25333
CAPPELLI, P. G. N80-25604
CARBON, R. N80-25459
CARDOSO, S. N80-25796
CARLEEN, E. N80-25361
CARLSON, C. E. K. N80-25382
CARLSON, K. W. N80-25709
CARLSON, T. H. N80-25740
CARMAN, G. L. N80-25370
CARPENTER, D. N80-26133
CARPENTER, M. C. N80-25777
CARR, M. H. N80-26239
CARRIGAN, B. N80-26189
N80-26190
N80-26192
N80-26246
CARTER, B. D. N80-25735
CARTER, W. P. L. N80-25839
CARUSO, L. N80-25713
CASAPRIMA, R. N80-25459
CASKEY, G. R., JR. N80-25422
N80-25428
CASTNER, D. G. N80-26186
CASTRUCCIO, P. A. N80-25756
CATALANO, G. D. N80-25589
CAUSSIGNAC, J. M. N80-25715
CAVAGNARO, D. M. N80-25451
N80-25452
N80-25478
N80-25479
N80-25676
N80-25677
N80-25678
N80-25679
CAVALCANTI, I. F. A. N80-25914
CAVALIERI, D. J. N80-25782
CAVANAGH, L. A. N80-25934
CEBALLOS, D. C. N80-26062
N80-26096
CELOTTA, R. J. N80-26187
CHA, B. K. N80-25867
CHABOCHE, J. L. N80-25896
CHAI, A. T. N80-26182
CHAN, W. Y. W. N80-25498
CHANG, A. T. C. N80-25761
CHANG, C. H. N80-25656
CHANG, T. Y. N80-25464
CHAO, K. A. N80-26124
N80-26190
CHAPMAN, D. C. N80-25336
CHAWLA, T. C. N80-25631
CHEN, A. T. F. N80-25985
CHEN, E. P. N80-25393
N80-25394
CHERVILLE, J. N80-25458
CHIAN, A. C. L. N80-26151
N80-26152
CHIAPPETTA, L. N80-25453
CHIN, S. M. N80-26079
CHIU, Y. T. N80-25365
CHOMA, J., JR. N80-25543
CHOPRA, P. S. N80-25687
N80-25688
CHOU, C. K. N80-25881
CHOU, S. P. N80-26101
CHOUDHURY, B. J. N80-25781
CHRISTENSEN, D. L. N80-25873
CHYLEK, P. N80-25648
CIHLAR, J. N80-25741
CLARK, A. N80-25868
CLARK, B. A. J. N80-25312
CLARKSON, T. B. N80-25057
CLEMENA, G. G. N80-25932
CLEMESHA, B. R. N80-25974
CLINE, T. L. N80-26230
N80-26252
COCHRAN, S. G. N80-25469
COFFEY, H. E. N80-26244
N80-26245
COHEN, R. L. N80-26112
COLGATE, S. A. N80-26232
COLLAROS, G. J. N80-25826
COLLINS, C. I. N80-25395
COLLINS, J. D. N80-25861
COLLINS, R. P. N80-25408
COLP, J. L. N80-25859
COLTMAN, R. R., JR. N80-25551
COLWELL, R. N. N80-25734
CONNOR, D. W. N80-25867
COOK, J. D. N80-25800
COOKE, C. M. N80-25553
COOKE, J. M., JR. N80-26122
COOPER, F. N80-26191
COOPER, J. F. N80-25893
CORNELL, C. A. N80-25961
CORNELL, M. N80-26217
N80-26218
CORNWALL, J. M. N80-25365
COTTER, R. J. N80-25946
COUSTON, M. N80-25489
COUTTS, G. W. N80-25853
CRAIG, J. D. N80-26021
CRAWFORD, J. N80-25783
CROSA, L. M. N80-28227
CROSS, K. E. N80-25828
CROWLEY, J. L. N80-25882
CRUZ, B. G. N80-25797
CSAKI, P. N80-25731
CSONKA, P. L. N80-25844
CUDAHY, G. F. N80-25589
CUMALI, Z. O. N80-25798
CUMMINGS, W. C. N80-25527
CUNNINGHAM, J. C. N80-25843
CUNNINGHAM, S. J. N80-25906
N80-25907
CUNNINGTON, G. R. N80-25868
CURRY, R. E. N80-26040
CURTIN, T. B. N80-28024
CURTISS, L. A. N80-25403
CUSHING, K. M. N80-25858
CUTLER, J. L. N80-25382
CYRE, W. R. N80-28195

D

DAHL, G. N80-25279
N80-25283
DANAHER, E. J. N80-25758
DANIELSON, J. A. N80-25752
DANKEL, D. D., II N80-26194
DARNALL, K. N80-25839
DAS, K. P. N80-26117
DASCHER, R. E. N80-25826
DASILVA, A. F. N80-25391
N80-26190
DAVID, M. L. N80-25807
DAVID, S. A. N80-25424
DAVIS, D. L. N80-25942
DAVIS, J. G. N80-26038
DAVIS, S. H. N80-25777
DAVIS, W. N80-28181
DAVIS, W. C. N80-25825
DAVISON, C. N80-25804
DECAMARGOS, L. R. N80-28059
DECFILHO, A. W. N80-28060
DECKER, C. E. N80-25953
DEFACIO, B. N80-25397
DELEON, P. N80-25839
DELPUECH, A. N80-25458
DEMANCHE, J. M. N80-28027
DEMORAES, J. C. N80-25897
DENISON, D. E. N80-25372
DENT, J. B. N80-25456
N80-25457
DESAI, U. D. N80-26230
DESCH, M. D. N80-26231
DESOUZA, C. R. N80-26059
DESPIC, A. R. N80-25431
DEVEREUX, O. F. N80-25433
DEWITT, E. N80-26005
DICHIARO, J. V. N80-25450
DICKINSON, J. D. N30-25540
DILLARD, J. P. N80-25750
DILLEY, J. V. N80-26034
DILLON, J. J. N80-25482
DIMARCO, D. M. N80-25898
DIVERGILIO, W. F. N80-26168
DOCTOR, R. D. N80-25477
DODDS, J. G. N80-25522
DODDS, W. J. N80-25844
DODSON, D. J., JR. N80-25544
DOGGETT, R. V., JR. N80-25321
DOLTSINIS, J. S. N80-25699
DOMINGORENA, A. A. N80-25630
DONIAKOWSKI, T. D. N80-25890
DONG, J. G. N80-25523
DONOHUE, D. L. N80-25389
DONOVAN, J. A. N80-25428
DOSS, E. D. N80-26162
N80-26166
DOYAL, L. A. N80-26167
DRAPER, B. L. N80-26078
DRAZIC, D. M. N80-25550
DUDMAN, A. E. N80-25431
DUFF, W. F. N80-25327
DUFFY, J. J. N80-25884
DUPUY, C. N80-28037
N80-25295

E

EARL, W. B. N80-25456
N80-25457
EASTMAN, T. E. N80-25859
ECKSTEIN, M. N80-25368
EDSTROM, C. M. N80-25420
EDWARDS, R. M. N80-25311
N80-25313
EHRET, C. F. N80-26038
EICHELBERGER, E. C., JR. N80-25701
EIDE, D. G. N80-26198
EIGER, A. N80-26079
EISENSTATT, L. R. N80-25866
EKLUND, R. H. N80-25385
ELCHERT, K. C. N80-25372
ELIAS, M. N80-25866
ELLINGSON, W. A. N80-25712
EMERGY, J. D. N80-25667
ENGRAND, D. N80-26261
ERGUN, S. N80-25485
ESCH, H. N80-25302
ESTES, R. H. N80-25967
ESTEVA, D. J. N80-25852
ETTER, D. M. N80-25537
EVANGELOU, P. N80-25301
EVANS, B. A. N80-25993
EVANS, G. F. N80-25953
EVANS, J. C. N80-26182
EVANS, N. N80-26239
EVERETT, R. N. N80-26077
EWING, D. D. N80-25681

F

FABIANO, E. B. N80-25967
FAGERLUND, A. C. N80-26114
FAIR, D. H. N80-25851
FALABELLA, R. N80-25443
FALLON, P. N80-25488
FARGEON, C. N80-26052
FARIA, A. D. N80-26033
FASSBENDER, L. L. N80-25865
FEISTEL, T. W. N80-25318
FEIZPOUR, A. A. N80-25861
FELCHER, G. P. N80-26187
FELSEN, L. B. N80-26140
FENG, T. Y. N80-26048
FENVES, S. J. N80-25496
FERREIRA, N. J. N80-25899
FINEBERG, N. S. N80-26104
FINK, J. K. N80-25402
FINK, L. H. N80-25808
FINKELSTEIN, P. L. N80-25953
FINNI, P. A. N80-25895
FISCHER, C. F. N80-26130
FISCHER, J. N80-25731
FISHER, W. J. N80-25382
FISSAN, H. N80-25352
FITCH, L. T. N80-25550
FITZJARRALD, D. E. N80-25813
FLETCHER, G. N80-25795
FONG, A. N80-25826
FONTANELLA, J. F. N80-26144
FOO, C. H. N80-25924
FOOKES, T. W. N80-25458
N80-25457
FOOS, J. N80-25891
FOREST, C. A. N80-25374
FORMAN, P. R. N80-26170
FORTUNE, M. A. N80-25899
FOSTER, J. N. N80-26193
FOSTER, R. B. N80-25890
FRANCHETTI, V. M. N80-25405
FRANK, A. A. N80-25868
FRANKLIN, H. N80-25459
FRASER, T. N80-25456
N80-25457
FRASIER, C. E. N80-26057

FRAZER, J. E. N80-25951
FREEMAN, C. E. N80-25296
FREEMAN, N. N80-25735
FREEMAN, T. L. N80-26001
FRIEDMAN, E. N80-25673
FRITTS, H. C. N80-26005
FRONIEP, R. N80-25316
FRURIP, D. J. N80-25403
FU, C. M. N80-25816
FU, T. H. N80-25577
FUHS, A. E. N80-25598
N80-25600
FUHS, S. E. N80-25598

G

GAFFIN, W. O. N80-25332
GAGLIANI, J. N80-25855
GALLOWAY, E. N80-26199
GALLOWAY, T. R. N80-25905
GARBARZ, J. J. N80-25955
GARCIA-MARTINEZ, D. V. N80-25482
GARDNER, M. R. N80-25893
GARRETT, D. E. N80-25488
GATES, W. G. N80-25449
GAUVRIT, M. N80-26052
GAVEL, D. T. N80-26106
GAVEL, P. N80-25309
GEBHART, J. E. N80-25943
GEDAYLOO, T. N80-25980
GEDWILL, M. A. N80-25412
GEHRKE, G. R. N80-25669
GEKELMAN, W. N80-26198
GELLES, S. N80-25354
GENNA, J. L. N80-26148
GEORGE, G. S. N80-25462
GEORGIOU, G. E. N80-26184
GERARDI, A. G. N80-25326
GEYER, H. K. N80-26182
GIBERT, P. N80-26200
GILBERT, J. N80-25456
N80-25457
GILBERT, K. N80-25602
N80-25605
GILBERT, K. G. N80-25599
N80-25612
GILES, W. B. N80-25822
GILL, D. H. N80-25649
GIORGIONE, D. M. N80-26147
GIRARD, R. N80-26259
GIRD, R. S. N80-25757
GLEICK, P. H. N80-25892
GLENN, H. D. N80-25819
GLOERSEN, P. N80-25762
N80-25763
GLYNN, E. F. N80-25807
GOLDBERT, A. J. N80-25923
GOLDMAN, A. N80-26125
GOLDMAN, H. N80-25782
GOLDSTEIN, D. B. N80-25849
GOLDSTEIN, N. E. N80-25549
GONZALES, R. W. N80-25770
GONZALES, W. D. N80-25973
GOODWIN, G. M. N80-25424
GORADIA, C. N80-26182
GORDON, G. A. N80-26005
GORMAN, M. R. N80-25690
GOWARD, S. N. N80-25737
GOZEWSKI, C. M. N80-25920
N80-25925
GRABOSKE, H. C., JR. N80-25404
GRAMMEL, S. J. N80-26162
GRASSBERGER, R. E. N80-25826
GREEN, D. A. N80-26079
GREENE, E. R. N80-26036
GREENWOOD, G. J. N80-25460
GREGORY, R. A. N80-25321
GRIEGO, D. B. N80-25826
GRINDSTAFF, Q. G. N80-25480
GROS, J. G. N80-25894
GUIDOTTI, R. N80-25848
GUIMARAES, P. S. N80-26178
GULL, T. R. N80-26229
N80-26236
GUMASTE, U. V. N80-26042
GURALNIK, G. S. N80-26191
GURTLER, R. W. N80-25844

H

HAAGENSON, P. N80-26018
HABERCOM, G. E., JR. N80-25303
N80-25304
N80-25305
N80-25342
N80-25343
N80-25497
N80-25632
N80-25633
N80-25680
HACKETT, J. E. N80-25297
HAEFNER, H. N80-25747
HAINES, R. F. N80-26039
HAJDU, L. N80-25731
HALL, D. K. N80-25759
HALL, R. L. N80-25754
HALL, R. M. N80-25815
HALLENBECK, P. C. N80-25852
HAM, W. E. N80-25585
HAMELIN, M. N80-26173
HAN, K. W. N80-25481
HAN, Y. J. N80-26014
HANCOCK, J. P. N80-25297
HANNAFORD, J. F. N80-25753
N80-25754
HARDIS, L. N80-25763
HARKNESS, J. B. L. N80-25477
HARLOW, A. N80-25713
HARPOLD, J. C. N80-25369
HARRINGTON, J. A. N80-26141
HARRIS, G. S. N80-25456
N80-25457
HARRISON, C. W., JR. N80-25526
HARRISON, F. L. N80-25432
HARSCH, H. N80-25276
HARTMAN, R. A. N80-25286
HARTNETT, E. B. N80-25361
HARTUNG, J. N80-26043
HATZOPOULOUS, J. N. N80-25963
HAUSER, J. R. N80-25912
HAUTALA, R. R. N80-25869
HAWKE, R. S. N80-25641
HAYDOCK, F. M. N80-25729
HAYES, G. S. N80-26023
HAYES, J. V. N80-26002
HAYES, S. R. N80-25850
HAYN, D. N80-25375
HAZONY, Y. N80-26079
HEHEMANN, R. F. N80-25707
HEIN, G. N80-25795
HELSPER, C. N80-25352
HENDERSON, M. N80-26141
HENNEKE, E. G. N80-25381
HENRY, M. H. N80-26131
HENRY, P. M. N80-25396
HENRY, W. M. N80-25936
N80-25937
HERNDON, E. S. N80-26082
HEUSCHKEL, J. N80-25706
HIELTJES, A. H. M. N80-25722
HILDEBRANDT, F. N80-25289
HILL, J. C. N80-25620
HILL, V. L. N80-25415
HILLE, H. K. N80-25916
N80-25917
N80-25918
HINDMAN, R. G. N80-25293
HIRSCH, K. N80-25656
HIRSINGER, F. N80-25488
HITCHMAN, M. H. N80-26014
HITE, R. N80-25371
HIXON, C. W. N80-25380
HOCHSTEIN, A. N80-25371
HODGE, P. E. N80-25412
HODGE, S. A. N80-25629
HOELL, J. N80-26125
HOFER, K. E. N80-25415
HOFFMAN, A. L. N80-26169
HOFFMAN, M. Z. N80-25896
HOFFMAN, R. W. N80-26144
HOFFMANN, H. N80-25290
HOFFMEISTER, F. N80-26029
HOLDREN, J. P. N80-25802
HOLMES, J. K. N80-25521
HOLSTER, J. L. N80-25574
HOLT, S. S. N80-26235
N80-26251
HOMAN, D. J. N80-25372
HOMYAK, L. N80-25339
HOOPER, F. C. N80-25909
HOOVER, L. J. N80-25823
HOPKINS, M. S. N80-26056
HORSFELD, L. M. N80-25572
HOTZ, G. M. N80-25338
HOWARD, J. B. N80-25459
HOWE, S. N80-25494
HOWES, J. E., JR. N80-25937
HOYLAND, C. M. N80-26072
HROVAT, D. N80-25432
HSIEH, C. K. N80-25814
HSIEH, C. P. N80-26046
HUANG, F. C. N80-25570
HUANG, H. T. N80-25891
HUANG, M. Y. N80-25544
HUANG, N. N80-26023
HUB, K. A. N80-25894
HUBBARD, R. F. N80-26231
HUBER, C. C. N80-25894
HUBREGTSE, K. N80-25949
HUMPHREYS, V. E. N80-25415
HUMPHRIES, T. S. N80-25413
HUNDEMANN, A. S. N80-25771
HUNT, D. F. N80-25304
N80-25386
HUNT, J. H. N80-26005
HUNTER, S. M. N80-26008
HURRASS, K. N80-25288
HUSBEIN, H. M. G. E. N80-26031
HUTH, G. K. N80-25522

I

IKUTA, K. N80-26198
IMIG, L. N80-25893
ISHII, K. N80-25155
ISHII, M. N80-25631
IYICAN, L. M. N80-25573

J

JACOBSON, E. N80-25795
JAERMARK, B. N80-25694
JAGODZINSKI, P. W. N80-26121
JAMES, L. W. N80-25843
JAMIESON, W. M. N80-25364
JANSEN, M. J. W. N80-26098
JANZ, G. J. N80-25401
JARBOE, D. M. N80-25429
JARDIM, J. O. D. N80-26254
JARMAN, B. D. N80-25650
N80-25651
N80-25652
JAYARAMAN, N. I. N80-25773
JENG, B. R. A. N80-26044
JENSEN, D. R. N80-26090
JENSEN, M. K. N80-25576
JENSEN, O. K. N80-25580
JENSEN, S. O. N80-25850
JEPPS, G. N80-25587
JERKE, J. M. N80-25564
JHUNJHUNWALA, A. N80-26174
JOERGENSON, S. E. N80-25720
JOHNSON, C. B. N80-25614
JOHNSON, D. A. N80-25594
N80-25604
JOHNSON, E. N80-25421
JOHNSON, E. W. N80-25419
JOHNSON, G. L. N80-25807
JOHNSON, N. B. N80-25308
JOHNSON, P. E. N80-26222
JOHNSON, R. W. N80-25623
JOHNSON, S. N80-25853
N80-25854
JOHNSON, W. S. N80-25379
JOLANKAI, G. N80-25727
N80-25731
JONATH, A. D. N80-25862
JONES, A. B. N80-25662
JONES, E. B. N80-25785
JONES, J. E. N80-26107
JONES, J. M., II N80-26073
JORDA, R. M. N80-25863
JOVANOVIC, B. N80-25431
JUNGA, F. A. N80-25862

K

KAFATOS, M. N80-26236
KAKARALA, S. N80-25447
KALBE, H. N80-25289
KALUZIENSKI, L. J. N80-26235
KANEMURA, T. N80-26160
KANE, D. L. N80-25983
KANE, R. P. N80-25969
N80-25970
N80-25975
N80-26253
KARPLUS, H. B. N80-25640
KARULKAR, P. C. N80-26176
KATINSZKY, E. A. N80-25334
KATZ, A. N80-25827
KAUL, R. N80-25520
KAVAYA, M. J. N80-25538
KAWATA, T. N80-26158
N80-26157
KELLY, B. E. N80-25803
KELSALL, D. N80-25803
KEMPE, G. N80-25328
KENNEDY, F. M. N80-25481
KENNEDY, R. P. N80-25981
KERLEY, G. I. N80-25396
KERNOHAN, R. H. N80-25551
KHAN, M. M. S. N80-25292
KHORRAM, S. N80-25734
KIBE, J. N. N80-26139
KIESLING, J. N80-25357
KILB, C. E. N80-25825
KILLACKEY, J. J. N80-25334
KINAL, G. N80-25520
KINARD, C. N80-25405
KING, M. J. N80-25864
KING, R. B. N80-25969
KINICKI, R. M. N80-26051
KINOSHITA, K. N80-25895
KIOCK, R. N80-25352
KIRCHHOFF, V. W. J. H. N80-25974
KIRDAR, E. N80-25749
KIRKPATRICK, A. R. N80-25842
KIRSHNER, R. P. N80-26228
KISSEL, G. N80-26216
KLABUNDE, C. E. N80-25551
KLETT, P. A. N80-25581
KLIMAS, P. C. N80-25807
KLOEBER, G. N80-26217
N80-26218
KLOSTER, M. N80-25281
KNIGHT, A. W. N80-25734
KNIGHT, B. A. N80-25857
KNIGHT, C. A. N80-26008
KNISELEY, R. N. N80-25552
KNOLL, J. E. N80-25953
KO, P. Y. N80-25616
KOCHHAR, A. K. N80-26053
KOCHIAN, L. V. N80-25852
KOEPLINGER, G. N80-26072
KOHLS, J. F. N80-25821
KOLB, C. E. N80-25920
KOMATSU, N. N80-25541
N80-25542
KOOI, C. F. N80-25982
KORDESCH, K. V. N80-26216
KORNHAUSER, A. L. N80-26079
KOSCHEL, W. N80-25277
KOTWAL, R. A. N80-25859
KOVACIC, J. E. N80-25850
KRACK, K. N80-26181
KRAFT, C. C., JR. N80-25360
KRASNA, A. I. N80-25490
KRAUS, J. N80-25861
KRAUSS, A. N80-25328
KRELL, B. E. N80-25358
KREMPL, E. N80-25416
KRESS, M. P. N80-26070
KRIESE, J. T. N80-26232
KRIJN, R. N80-25287
KRONBERG, J. N. N80-25550
KUBOTA, Y. N80-26155
KUCERA, G. H. N80-25895
KUJAWSKI, D. N80-25418
KULESA, F. N80-26216
KUMAR, A. N80-26238
KUMAR, R. N80-26059
N80-26060
KUNG, H. T. N80-26069
KURTANJEK, Z. F. N80-25390
KUSTOM, R. L. N80-25546
KUTAL, C. R. N80-25869

L

LAANANEN, D. H. N80-25307
LACHAPELL, M. J. N80-25653
LADD, D. M. N80-25484
LAKSHMIKANTHAM, V. N80-26091
LAMORTE, M. F. N80-25912
LANCASTER, E. R. N80-25967
LANGAN, L. N80-25955
LANGEL, R. A. N80-25967
LANGJAHR, D. N80-26045
LARSSON, S. E. N80-25695
LATHROP, J. W. N80-25781
LAURITSON, L. N80-25772
LAWRENCE, K. N80-25828
LEAF, C. F. N80-25751
LEAMY, M. L. N80-25456
N80-25457
LEARY, P. L. N80-26075
LEE, D. O. N80-25823
LEE, S. H. N80-25582
LEESE, J. G. N80-26175
LEGENDRE, R. N80-25486
LEGGE, R. N80-25844
LEGRIVES, E. N80-26257
LEHMANN, E. J. N80-26020
LEIBOWITZ, L. N80-25402
LEITAO, C. D. N80-26023
LEMES, M. A. M. N80-25996
LEMPICKI, A. N80-25812
LENTZ, R. W. N80-25692
LEUZE, R. E. N80-26135
LEVINE, M. D. N80-25849
LEWIS, B. T. N80-26049
LEWIS, R. A. N80-25737
LEWIS, T. S. N80-25567
LICHTIN, N. N. N80-25896
LIEN, R. H. N80-25940
LIKLEMA, L. N80-25722
LIM, J. T. N80-25987
LIN, C. J. N80-25688
LIN, H. C. N80-25853
N80-25854
LIN, R. J. H. N80-25448
LINGENFELTER, R. E. N80-26229
LINTZ, A. T. N80-26212
LIU, C. T. N80-25962
LIU, T. K. N80-25430
LLOYD, D. N80-25756
LOATS, H. L., JR. N80-25756
LOCKWOOD, A. N80-25809
LOEF, G. O. G. N80-25864
LOEFER, G. R. N80-25847
LOEPPKY, J. A. N80-26036
LOFGREN, G. R. N80-26005
LOGOFET, D. O. N80-25729
LOHMANN, D. N80-26116
LOISEAU, H. N80-25491
LOKMANHEKIM, A. H. N80-25849
LOMBARDI, F. N80-25980
LONG, C. J. N80-25551
LONG, R. H. N80-25471
LONG, S. J. N80-25951
LORENA, L. A. N. N80-26197
LORENZEN, M. W. N80-25729
N80-25732
LOSEKE, W. A. N80-25951
LOUIS, D. N80-26261
LOWENTHAL, D. D. N80-26169
LUCKYANOV, N. K. N80-25728
LUDWIG, F. L. N80-25933
LUDWIG, G. O. N80-26153
LUHMANN, J. G. N80-25365
LULA, J. W. N80-25548
LUTIN, J. M. N80-26079
LYON, T. F. N80-25944
LYONS, J. N80-25371

M

MAAHS, H. G. N80-25392
MABBOT, G. A. N80-25388
MABE, W. B. N80-25764
MACH, W. N80-25282
MACHOL, R. E. N80-26263
MACMILLAN, H. F. N80-25882
MADDALONE, R. N80-25947
MAHURIN, S. L. N80-25702
N80-25703
MAINGUY, A. M. N80-26256
MAINO, R. P. N80-25410
MAJA, M. N80-26211
MALIK, M. N80-25507
MALIK, R. K. N80-25423
MANN, J. N80-25713
MANNA, Z. N80-26074
MANSON, W. I. N80-25518
MARCELINO, B. C. N80-25914
MARCHETTO, M. N80-26211
MARGOLIS, J. W. N80-25839
MARION, R. H. N80-25857
MARKWORTH, A. J. N80-25354
MARLATT, W. E. N80-25785
MAROUARDT, M. B. N80-26071
MARSHALL, R. C. N80-26183
MARSHALL, T. R. N80-25863
MARTIN, D. A. N80-25940
MARTIN, D. K. N80-25495
MARTIN, M. D. N80-26240
MARTINEC, J. N80-25755
MARX, K. D. N80-26094
MASCARENHAS, N. D. A. N80-26059
MATTHAEUS, W. H. N80-26148
MAUCH, H. N80-25341
MAUERBERGER, P. N80-25725
MAVEC, J. A. N80-25866
N80-25872
MAYHAN, J. T. N80-25527
MCALLISTER, J. E., JR. N80-25578
MCARDLE, J. G. N80-25329
MCBREEN, J. N80-26216
MCCANDLESS, F. P. N80-25398
MCCLANATHAN, L. N80-25797
MCCLELLAND, J. F. N80-25552
MCCLENAHAN, J. D. N80-25900
MCCOLLUM, B. C. N80-25812
MCCOY, M. J. N80-26089
MCDERMOTT, D. J. N80-25811
MCDONALD, M. N80-25977
N80-25978
MCELROY, F. F. N80-25941
MCELROY, J. L. N80-26131
MCGREW, J. M., JR. N80-25862
MCHARDY, J. N80-25891
MCKELVEY, W. D. N80-25448
MCKINZIE, D. J., JR. N80-26115
MCKOWN, M. M. N80-25843
MCMILL, J. D. N80-26023
MCMILLAN, J. D. N80-26054
MCNAB, T. K. N80-25862
MCNAMARA, T. N80-26217
N80-26218
MCVEIGH, J. N80-25891
MEAD, G. D. N80-25967
MECHOLSKY, J. J. N80-26145
MEDRANO-B., R. A. N80-26088
N80-26243
MEEKS, S. A. N80-25845
MEHTA, H. K. N80-25585
MEIERAN, H. B. N80-25708
MEISNER, N. B. N80-25533
MELAS, A. A. N80-25842
MEMMOTT, J. V. W. N80-25382
MENDEL, J. E. N80-26131
N80-26132
MENEGHINI, R. N80-25989
MENSING, R. W. N80-25981
MERRITT, P. N80-25807
MESHII, M. N80-25425
MICNAS, R. N80-26124
MIDGETT, M. R. N80-25954
MIKESELL, R. D. N80-25486
MILLER, D. R. N80-25815
MILLER, D. W. N80-25349
MILLER, I. M. N80-25392
MILLER, R. A. N80-25412
MILLER, S. H. N80-25733
MILLER, W. F. N80-25735
MILNOR, S. N80-26133
MINTZER, I. N80-25892
MISSIMER, J. R. N80-25584
MITCHELL, W. J. N80-25954
MIYAMOTO, K. N80-25852
MIYANO, K. N80-26187
MLEJNEK, H. P. N80-25700

MOFFITT, T. P. N80-25337
N80-25338
MOMENT, R. L. N80-25889
MONSLER, M. J. N80-25650
N80-25651
N80-25652
MONTALENTI, P. N80-26211
MONTE, R. N80-25900
MONTEZ, M. N. N80-25370
MOORE, A. S. N80-25339
MOORE, D. N80-25819
MOORE, P. N80-25719
MOORE, R. N80-25371
MOORE, T. A. N80-25518
MORAVEC, G. F. N80-25752
MORCHOISNE, Y. N80-25487
MORELLI, J. P. N80-25318
MORENUS, R. C. N80-25810
MORRIS, B. R. N80-25327
MORRIS, G. N80-25892
MORRIS, R. A. N80-25886
MORRIS, R. L. N80-26081
MORRIS, V. L. N80-25860
MOSCATI, A. N80-26217
N80-26218
MOSES, G. A. N80-26138
MOTLEY, E. P. N80-25797
MOTLEY, G. R. N80-25317
MOURA, A. D. N80-25996
MOYER, D. W. N80-25865
MUELLER, R. O. N80-25857
MULAK, P. N80-25489
MUNTEAN, R. A. N80-26241
MUNZ, D. N80-25717
MURRAY, W. N80-26133
MURRY, M. A. N80-25852
MYER, J. N80-26141
MYERS, G. I. N80-25758
MYHRE, J. M. N80-25682

N

NAGAKAWA, J. N80-25425
NARAYANA, A. D. N80-25408
NARDUCCI, L. M. N80-25586
NASERI-NESHAT, H. N80-25583
NASR, L. H. N80-25839
NEEDLEMAN, A. N80-25711
NEILSON, G. H. N80-26149
NELSON, E. E. N80-25413
NELSON, G. J. N80-25772
NERO, A. R. N80-26082
NETO, A. R. N80-26084
NETO, C. L. P. N80-26083
NEWELL, G. W. N80-26034
NEWMAN, P. A. B. N80-25756
NEWNAM, B. E. N80-25849
NGUYEN, T. N80-25887
NICHOLAS, E. B. N80-25393
NIETO, A. N80-25541
N80-25542
NIGRO, D. N. N80-26215
NILSEN, P. W. N80-25522
NISSEN, W. I. N80-25940
NISWANDER, J. K. N80-26053
NORBECK, E. N80-26137
NORRUP, L. V. N80-26212
NOWAK, A. V. N80-25849

O

OBRIEN, G. N80-25870
ODEGAARD, H. A. N80-25748
ODEN, J. T. N80-26092
ODONNELL, D. N80-25828
OEBERG, S. N80-25895
OFFIELD, T. W. N80-25733
OGALLAGHER, J. N80-25811
OGBUJI, L. U. J. N80-25445
OGREN, J. A. N80-25935
OHNUMA, T. N80-26154
OHSAWA, Y. N80-26160
OLAFSEN, A. G. N80-25852
OLDAKOWSKI, T. N80-25341
OLMEDO, L. N80-26064
OLSEN, J. N. N80-25654
OLSON, G. K. N80-25868
OLSON, R. E. N80-26129
OLSON, R. R. N80-25411
ORBON, S. N80-26073
ORGREN, P. J. N80-26050
ORLOB, G. T. N80-25432
ORMEROD, M. N80-25327
ORR, F. M., JR. N80-25788
ORWIG, C. F. N80-25750
ORZECHOWSKI, J. A. N80-25298
OSMONT, D. N80-26259
OSTREM, G. N80-25748
OTTEN, L. J., III N80-25599
N80-25601
N80-25604
N80-25606
OU, H. W. N80-26025
OVERLAND, J. E. N80-26014
OWENS, I. F. N80-25746

P

PACHECO, M. T. N80-26179
PACKARD, C. L. N80-25420
PADOVANI, E. N80-25713
PAFFRATH, D. N80-26006
PAN, S. S. N80-25669
PAN, Y. C. N80-26167
PARADA, N. D. J. N80-26178
PARK, C. G. N80-25425
PARK, J. E. N80-25628
PARK, W. N80-26163
PARKER, R. A. R. N80-26228
PARRA, C. G. N80-26023
PARSONS, C. L. N80-26023
PARTER, S. V. N80-26066
PARTS, L. N80-25815
PATTERSON, J. G. N80-25481
PATUMTAWAPIBAL, S. N80-25346
PAUL, J. F. N80-25724
PAULDING, B. N80-26133
PAUTZKE, C. G. N80-26028
PAYNE, B. W. N80-25327
PAYNE, D. G. N80-26247
PEACHE, M. A. N80-25855
PEDERSEN, B. M. N80-26231
PEEK, J. M. N80-26188
PENNELL, W. T. N80-25878
PEREIRA, A. E. C. N80-26083
PEREZ, J. N80-25519
PERRY, A. J. N80-25502
N80-25508
PESUT, R. N. N80-25837
PETERS, W. A. N80-25459
PETERSON, G. L. N80-26048
PETERSON, J. A. N80-25707
PETERSON, R. N80-25742
PETSCHEK, A. G. N80-26232
PHATAK, S. N80-25912
PHILLIPS, R. B. N80-26233
PHILLIPS, T. J. N80-26022
PHIPPS, C. R., JR. N80-25855
PIERCE, D. T. N80-26187
PIERCE, R. D. N80-25895
PIPHER, M. D. N80-25368
PITTS, J. N80-25939
POEPPEL, R. B. N80-25895
POHL, R. N80-25870
POLLACK, F. G. N80-25835
POLLARD, R. N80-25845
POLYDOROS, A. N80-25522
POORMAN, R. M. N80-25355
PORCELLA, R. L. N80-25984
PORTER, R. W. N80-25841
PORTO, F. W. N80-25772
POSDAMER, J. L. N80-25362
POSER, C. I. N80-25444
POWELL, J. D. N80-25347
POWELL, R. G. N80-25915
PRATT, C. F. N80-25446
PRINCE, J. L. N80-25550
N80-25781
PROWSE, T. D. N80-25746
PUIK, R. N80-26073
PUSCHELL, J. J. N80-26249
PYPER, J. W. N80-25893

Q

QUEEN, W. H. N80-25956
QUIMBY-HUNT, M. S. N80-25921
QUINCY, E. A. N80-25767
QUON, B. H. N80-26168

R

RABL, A. N80-25811
RAGATZ, P. H. N80-25397
RAGHUNATHAN, K. N80-26119
RAMAN, K. R. N80-25591
RAMATY, R. N80-26229
RAMIREZ, A. N80-26139
RAMSEY, W. C. N80-25944
RANA, D. S. N80-26055
RANGO, A. N80-25742
N80-25755
RAO, V. B. N80-25968
N80-25990
RAPHAEL, F. A. N80-25517
RAPP, E. A. N80-25550
RAPTIS, A. C. N80-25640
RASMUSSEN, J. J. N80-25848
RAVINDRA, M. K. N80-25981
RAWL, D. E., JR. N80-25428
RAYNARD, A. E. N80-25861
RAYNOR, G. S. N80-26002
REBBI, C. N80-26185
RECK, G. P. N80-26126
REDA, D. C. N80-25626
REED, T. N80-25810
REED, W. E. N80-25434
N80-25435
N80-25436
N80-25437
N80-25438
N80-25439
N80-25440
N80-25441
N80-25442
N80-25531
N80-25532
N80-25555
N80-25556
N80-25557
N80-25558
N80-25559
N80-25561
N80-25562
N80-25563
N80-25566
N80-25674
N80-25675
REINER, P. N80-26109
RETZLOFF, D. G. N80-25397
REYNOLDS, D. W. N80-26019
RHODES, C. G. N80-25417
RHODES, L. J. N80-25913
RHODES, R. C. N80-25951
RICE, J. N80-25906
RICE, J. R. N80-25711
RICE, M. J. N80-25844
RICH, E. I. N80-25738
RICHARD, J. P. N80-26181
RIESENFELD, W. N80-26170
RIFFEL, R. E. N80-25335
RIGGIO, R. F. N80-26010
RINEHART, R. E. N80-26016
RIOS, A. N80-26065
RIVEROS, C. A. N80-25549
RKLUND, R. N80-26180
ROBASZKIEWICZ, S. N80-26124
ROBBINS, D. E. N80-25985
ROBBINS, D. K. N80-26076
ROBERTS, E., JR. N80-25635
ROBERTSON, S. H. N80-25308
ROBINSON, E. N80-26012
ROBINSON, F. N80-25280
ROBINSON, J. N. N80-25350
N80-25351
ROCHE, S. L. N80-25856
RODEAN, H. C. N80-25529
RODRIGO, P. N80-26052
ROEDEL, S. N80-25833
ROEMMICH, D. H. N80-26026
ROGERS, J. C. N80-26109
ROGERS, J. D. N80-25805
ROMERO, M. N80-26256
ROPE, E. L. N80-25524
ROSE, W. C. N80-25594
N80-25604

N80-25806
ROSENFELD, A. N80-25836
ROSENFELD, A. H. N80-25849
ROSENTHAL, R. N80-25533
ROSKIES, R. N80-26191
ROSS, W. A. N80-26132
ROTHE, E. W. N80-26128
ROTHROCK, M. D. N80-25305
RUBEN, H. D. N80-25284
RUDNICK, J. J. N80-25837
RUHLIN, C. L. N80-25321

S

SACKS, R. A. N80-26182
SAKAI, J. I. N80-26156
N80-26157
SALA, D. L. N80-25890
SALAS, L. J. N80-25934
SALISBURY, G. C. N80-25703
SALLEE, G. P. N80-25340
SALOMONSON, V. V. N80-25759
SALZMANN, H. N80-25856
SAMUELS, G. N80-25871
SAND, R. J. N80-25845
SANDERSON, J. E. N80-25462
SANTANA, C. N80-26140
SANUKI, H. N80-26154
SARMA, K. R. N80-25844
SATO, K. N80-26160
SATYAMURTY, P. N80-25890
SAUNDERS, S. C. N80-25682
SAWYER, D. L. N80-26228
SCHAEFER, B. N80-25367
SCHAMING, W. B. N80-25837
SCHATZLE, P. R. N80-25897
SCHEPPELE, S. E. N80-25480
SCHIEFELBEIN, G. F. N80-25485
SCHINDLER, H. D. N80-25471
SCHINDLER, R. H. N80-26127
SCHIPPER, L. N80-25881
SCHNEIDER, R. W. N80-25309
SCHMITT, A. L. N80-25319
SCHMUCKER, R. H. N80-25375
SCHNEIDER, S. B. N80-25758
SCHNEIDER, S. R. N80-25744
SCHUELE, D. E. N80-26144
SCHULZ, M. N80-25365
SCHUMANN, H. H. N80-25749
SCHWARTZ, M. N80-26213
SCOBLE, W. R. N80-25882
SCOGGINS, J. R. N80-26013
SCOTT, D. S. N80-25322
SCRIBNER, E. N80-25934
SCUDDER, J. K. N80-25841
SEALOCK, L. J., JR. N80-25485
SEIFERT, D. J. N80-26072
SEKIGUCHI, T. N80-26160
SEMMENS, M. G. N80-25826
SERATA, S. N80-26133
SERIO, M. A. N80-25459
SERLEMITSOS, P. J. N80-26251
SETZER, A. N80-25914
SEWARD, W. H. N80-25477
SEZGEN, A. O. N80-25796
SHACK, W. J. N80-25712
SHAFER, B. A. N80-25751
SHAMPINE, L. F. N80-26093
SHAPIRO, M. A. N80-26018
SHARP, D. N80-26191
SHARPE, S. M. N80-26047
SHAW, B. J. N80-25419
N80-25421
SHELBY, J. E. N80-25858
SHELSWELL, P. N80-25512
SHEN, H. W. N80-25879
SHER, L. N80-25807
SHERWOOD, D. N80-26133
SHIGEISHI, H. N80-25834
SHIH, P. S. N80-25778
SHIN, K. S. N80-25425
SHIPPELL, R. J., JR. N80-25705
SHULTIS, J. K. N80-25807
SHURE, M. N80-26144
SIDDHANTY, M. N. N80-26110
SIEVERS, A. J. N80-26143
SIGAL, A. N80-25322
SIH, G. C. N80-25393
N80-25394
SILER, R. K. N80-25994
SILLMAN, S. N80-25900
SILVER, J. A. N80-25820
N80-25825
SIM, J. W. N80-25895
SIMMONS, A. J. N80-25527
SIMMONS, G. N80-25713
SIMMONS, J. R. N80-25414
SIMON, M. K. N80-25522
SIMONEN, F. A. N80-25705
SIMONI, P. O. N80-26033
SIMONICH, D. M. N80-25974
SINGH, B. B. N80-25470
SINGH, H. B. N80-25934
SINGH, R. N. N80-25895
SINGPURWALLA, N. D. N80-25993
SIREY, S. N80-25713
SLAYMAN, C. N80-26142
SLEMMONS, A. J. N80-25903
SLIFER, L. W., JR. N80-25789
SLIVINSKY, C. N80-25346
SLOAN, J. S. N80-26223
SMALL, J. C. N80-26100
SMITH, A. J. N80-25934
SMITH, A. L. N80-25454
SMITH, D. L. N80-25575
SMITH, J. R. N80-25670
SMITH, L. G. N80-25964
N80-26242
SMITH, M. R. N80-25892
SMITH, P. D. N80-25981
N80-26096
SMITH, S. G. N80-25846
SMITH, T. M. N80-26095
SMITHRICK, J. J. N80-25780
SOBEL, H. N80-25908
N80-25909
SOBRAL, J. H. A. N80-25972
SOBRAL, Z. R. N80-25998
SOFIA, S. N80-26236
SOLIMAN, Z. S. N80-26103
SOLOMON, J. L. N80-25735
SORATHIA, U. A. N80-25955
SORENSON, S. C. N80-25959
SOULE, H. V. N80-25762
SOUZA, C. D. R. E. N80-26063
SPAHR, H. R. N80-25807
SPENCER, L. W. N80-25853
SPURRIER, F. R. N80-25686
SRINIVASAN, S. N80-26216
STAGE, S. A. N80-25988
STAPFER, G. N80-25809
STATTEL, R. J. N80-26053
STEARMAN, R. O. N80-25322
STEFFENS, H. D. N80-25503
N80-25507
STEINBACK, M. N80-25482
STEINBERG, M. N80-25468
STEINBERG, R. M. N80-25459
STEINMETZ, W. J. N80-25597
STETSON, P. B. N80-26221
STEUERWALT, M. N80-26096
STEVENS, R. K. N80-25955
STEVENS, W. K. N80-25568
STEWART, W. F. N80-25467
STEYERT, W. A. N80-25492
STIERMAN, R. J. N80-25554
STINCHCOMB, W. W. N80-25381
STOCKWELL, G. G. N80-25334
STODT, R. W. N80-26019
STORTI, G. N80-25853
N80-25854
STOVER, J. N80-25541
N80-25542
STRASKRABA, M. N80-25726
STREET, R. L. N80-25616
STRICKLAND, J. H. N80-25887
STROJAN, C. N80-25928
STRONG, K. N80-25371
STUEBER, T. F. N80-25826
STUEHLEN, B. N80-25282
SUCCOP, D. C. N80-25473
SUCHENTRUNK, R. N80-25505
SUGGS, J. C. N80-25954
SULLIVAN, R. N80-25796
SURANYI, P. N80-26134
SURLES, T. N80-25923
SUTHERLAND, C. D. N80-25922
SUTTON, G. W. N80-25596
SVIREZHEV, J. M. N80-25728
SWAIM, R. L. N80-25344
SWAN, H. W. N80-25708
SWANK, J. H. N80-26235
SWENSON, P. F. N80-25890
SYKES, A. L. N80-25953
SZANCA, E. M. N80-25337
SZETELA, E. J. N80-25453
SZYMKOWIAK, A. E. N80-26251

T

TABER, J. J. N80-25788
TAKAHASHI, H. N80-25974
TAKAHASHI, W. K. N80-26080
TAPIA, R. A. N80-26097
TARKINGTON, T. W. N80-25481
TARPLEY, J. D. N80-25758
TAYLOR, E. J. N80-26216
TAYLOR, K. J. N80-25642
TEEGARDEN, B. J. N80-26230
N80-26252
TEER, D. G. N80-25501
TEETER, R. R. N80-25364
TEPPER, S. N80-25334
THOMAS, I. L. N80-25746
THOMAS, J. P., JR. N80-25809
THOMAS, J. R. N80-25818
THOMAS, J. T. N80-25877
THOMAS, S. J. N80-25855
THOMPSON, Q. E. N80-25815
THOMPSON, R. E. N80-25686
THORNTON, J. A. N80-25882
TIMMERMAN, M. N80-25706
TIMMONS, M. L. N80-25912
TISON, R. R. N80-25890
TIWARI, S. N. N80-26238
TOENSKOETTER, H. N80-25278
TOLAND, D. N80-25891
TOWSE, D. N80-26133
TRAVASSOS, R. H. N80-25534
TRICOLES, G. N80-25524
TROIANO, A. R. N80-25707
TROLINGER, J. D. N80-25593
TRUDINGER, P. L. N80-25515
TRUHAN, J. J. N80-25376
TRYGAR, T. A. N80-25808
TSITKIN, M. Y. N80-25723
TUBBS, J. D. N80-25991
TUELLER, J. N80-26248
TUKEY, J. W. N80-26111
TULL, C. G. N80-26165
TURK, R. N80-26141
TURNER, A. K. N80-26079
TURNER, D. L., JR. N80-25387
TURNER, M. N80-25891
TURNER, N. N80-25870
TUTTLE, W. C. N80-26036
TYSON, C. A. N80-26034
TZUNG, F. K. N80-25704

U

ULLMAN, D. G. N80-25879
UNG, C. N80-25947
UNGPIYAKUL, T. N80-26108
URAMOTO, J. N80-26155
N80-26159

V

VAJED-SAMII, M. N80-26118
VANDELUNE, J. N80-26099
VANDERPLAATS, G. N. N80-25800
VANDERPLAS, A. N80-25843
VANKUIKEN, J. C. N80-25894
VANKURIEN, J. T. N80-25589
N80-25808
N80-25809
N80-25811
VANLEEUWEN, D. N80-25897
VANSTEE, E. W. N80-26035
VANSTRATEN, G. N80-25721
VASILYEV, V. B. N80-25723
VAVILIN, V. A. N80-25723
VENKATARAMAN, N. S. N80-25359
VEPA, K. N80-25981
VERHOFF, A. N80-25595
VERMERSCH, J. A. N80-26025

VETRONE, A. V. N80-26240
VINCENTY, T. N80-25776
VIOLA, F. E. C. N80-26083
VISWANADHAM, Y. N80-25971
VITKO, J., JR. N80-25858
VITTITOE, C. N. N80-26075
VUIGNER, A. A. N80-25334

W

WAGNER, J. P. N80-25807
WAGONER, D. E. N80-25953
WAITE, E. N80-25872
WAKEMAN, T. N80-25432
WALKER, K. L. N80-25579
WALL, W. F. N80-25834
WALLACE, R. N80-25520
WALLING, J. F. N80-25951
WALSTEAD, A. E. N80-25530
WALTERICK, R. E. N80-25808
WAN, C. A. N80-25911
WANG, G. C. N80-26187
WANG, L. K. N80-25496
WANG, M. H. N80-25488
WANG, P. N80-25866
WANG, S. N80-25636
WANG, W. C. N80-25979
WARD, D. E. N80-25806
WARD, J. W. N80-26184
WARD, M. A. V. N80-25672
WARSKOW, W. L. N80-25749
WATANABE, T. N80-26154
WATERS, C. A. N80-25407
WATKINS, D. E. N80-25855
WATSON, K. N80-25733
WATT, R. G. N80-26150
WEATHERBEE, R. L. N80-25623
WEBER, C. L. N80-25522
WEBER, J. N80-26181
WEBSTER, B. T. N80-25887
WEGENER, P. P. N80-25294
WEGLEY, H. L. N80-25878
WEID, F. N. N80-25376
WEIL, J. C. N80-25936
WEINBERG, J. L. N80-26237
WEINER, S. D. N80-25528
WEISS, D. J. N80-26095
WELDON, D. N80-25341
WEN, C. Y. N80-25481
WENZ, R. P. N80-26144
WERNER, C. L. N80-25920
WESEMAEL, F. N80-26224
WEST, A. S. N80-25484
WEST, C. A. N80-25543
WESTKAEMPER, J. C. N80-25322
WHALEY, T. P. N80-25890
WHEELER, V. A. N80-25951
WHITAKER, R. B. N80-25450
WHITE, R. L. N80-25536
WHITNEY, W. J. N80-25337
N80-25338
WIENER, E. L. N80-26040
WIESNET, D. R. N80-25745
WILCOXSON, A. L. N80-25855
WILKINS, J. W. N80-26143
WILLIAMS, J. A. N80-25709
N80-25710
WILLIAMS, S. F. N80-26013
WILLIAMS, S. G. N80-25735
WILLIAMSON, A. N. N80-25639
WILSON, E. E. N80-26011
WINER, A. M. N80-25839
WINGROVE, R. C. N80-25306
WINGER, M. N80-25739
WINKLER, S. N80-25617
WINSTON, R. N80-25811
WISE, D. L. N80-25482
WISSLER, T. N80-25713
WOLEJSZA, C. J., JR. N80-25516
WOLF, M. N80-25782
WOLFGRAM, D. F. N80-25368
WOLOSEWICZ, R. N80-25808
N80-25872
WOLOSEWICZ, R. M. N80-25687
WONG, A. Y. N80-26168
WONG, K. L. N80-25404
WONG, M. A. N80-26105
WOO, J., JR. N80-25982
WOODFORD, J. B. N80-25358
WOODIN, D. N80-26079
WRIGHT, C. C. N80-25334
WRIGHT, H. E. N80-25689
WRIGHT, R. N. N80-25488
N80-25498
WU, A. Y. N80-25836
WUESTENBERG, H. N80-25099
WUTTKE, W. N80-26029
WYNNE, F. E. N80-25473

Y

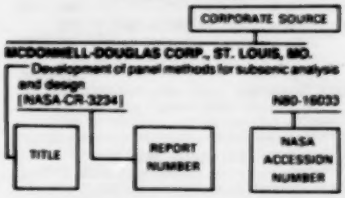
YATES, J. E. N80-25299
YEH, Y. C. S. N80-25493
YELLOWLEY, I. N80-25483
YEN, H. W. N80-26142
YEUNG, W. S. N80-25827
YORK, L. A. N80-26225
YOUNG, J. S. N80-26250
YOUNG, S. S. D. N80-25858
YUDOW, B. D. N80-25890

Z

ZACHARIAS, M. N80-25459
ZAMLUTTI, C. J. N80-25972
ZANDONELLA, A. N80-25736
ZAPP, P. E. N80-25427
ZAYAC, S. A. N80-25889
ZECEVIC, S. N80-25431
ZIMMER, P. B. N80-25448
ZIMMERMAN, R. K., JR. N80-25964
ZINN, J. N80-25922
ZOLLARS, G. F. N80-25363

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

AD-EX, PORTOLA VALLEY, CALIF.
Electrochemical properties of certain new ternary and quaternary alloys based on aluminum
[UCRL-TRANS-11535] N80-25431

Relation between the electronic structure and the shock sensitivity of nitrated secondary explosives. 3: Influence of the crystal environment
[UCRL-TRANS-11510] N80-25458

ADELPHI UNIV., GARDEN CITY, N. Y.
Feasibility study of using a coal/water oil emulsion as a clean liquid fuel
[FE-2437-T1-ADD] N80-25483

Second moments of optical degradation due to a thin turbulent layer N80-25587

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Aircraft dynamic response to damaged runways
[AGARD-R-685] N80-25325

Technical evaluation report on the 54th(A) Propulsion and Energetics Panel Meeting on Advanced Control Systems for Aircraft Powerplants
[AGARD-AR-152] N80-25347

Materials Coating Techniques
[AGARD-LS-108] N80-25499

AGARD highlights
[AD-A082980] N80-26262

AERODYNE RESEARCH, INC., BEDFORD, MASS.
Homogeneous production and removal of NOx from combustion exhaust gases
[ARI-RP-52] N80-25920

Homogeneous production and removal of NOx from combustion exhaust gases
[ARI-RP-49] N80-25925

AEROJET ENERGY CONSERVATION CO., SACRAMENTO, CALIF.
Multi-use geothermal energy system with augmentation for enhanced utilization. A non-electric application of geothermal energy in Susanville, California
[SAN-1740-2] N80-25868

AERONAUTICAL RESEARCH ASSOCIATES OF PRINCETON, INC., N. J.
Viscous thin airfoil theory
[NASA-CR-163069] N80-25299

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Visual problems and night landing guidance of the CH-47 (Chinook) helicopter
[ARL/SYS-TM-50] N80-25312

AEROSPACE CORP., EL SEGUNDO, CALIF.
Effects of construction and operation of a satellite power system upon the magnetosphere
[ATR-80(7824)-1] N80-25365

AEROSPACE CORP., LOS ANGELES, CALIF.
Communication satellite technology: State of the art and development opportunities
[NASA-CR-159977] N80-25358

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
USAF bioenvironmental noise data handbook. Volume 122: F-16 aircraft, near and far field noise
[AD-A081844] N80-25915

USAF bioenvironmental noise data handbook. Volume 144: F-106A in-flight crew noise
[AD-A081846] N80-25916

USAF bioenvironmental noise data handbook. Volume 145: F-106B in-flight crew noise
[AD-A081847] N80-25917

USAF bioenvironmental noise data handbook. Volume 146: F-16B in-flight crew noise
[AD-A081848] N80-25918

Various techniques for evaluating cardiodynamic function using chronically instrumented canine models
[AD-A071264] N80-26035

AIR FORCE AVIONICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach
[AD-A082494] N80-25313

AIR FORCE ENGINEERING AND SERVICES CENTER, TYNDALL AFB, FLA.
Runway surface roughness N80-25326

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Validity of small scale tests for turret/fairing loads and cavity effects N80-25611

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Gravity model evaluation for precise terrestrial inertial navigation: A system accuracy approach N80-25311

AIR FORCE WEAPONS LAB., KIRTLAND AFB, N. MEX.
Line spread instrumentation for propagation measurements N80-25592

Inviscid Flow Field Effects: Experimental results N80-25599

Overview of recent aero-optics flight tests N80-25601

Lear jet boundary layer/shear layer laser propagation experiments N80-25602

Cycle II.5 aircraft aero-optical turbulent boundary-layer/shear-layer measurements N80-25605

Summary of aerodynamic vibration effects on ALL turret N80-25607

Flow visualization techniques in the Airborne Laser Laboratory program N80-25608

Reduction of unsteady wind torques on an open port airborne optical turret N80-25609

Aero-optics overview N80-25612

AIRESEARCH MFG. CO., TORRANCE, CALIF.
Thermal-structural design study of an airframe-integrated Scramjet
[NASA-CR-159039] N80-25334

Design study of toroidal traction CVT for electric vehicles
[NASA-CR-159803] N80-25681

Advanced propulsion system for hybrid vehicles
[NASA-CR-159771] N80-28212

ALABAMA UNIV. IN HUNTSVILLE.
Data handbook for the national solar energy demonstration book
[DSE-5216-T4] N80-25873

ALASKA UNIV., COLLEGE.
The plasma boundary layer and magnetopause layer of the Earth's magnetosphere N80-25469

ALASKA UNIV., FAIRBANKS.
Determination of selected hydraulic properties of subarctic soils
[PB80-150956] N80-25983

ALUMINUM CO. OF AMERICA, ALCOA CENTER, PA.
Design and fabrication of a low-cost Darrieus vertical axis wind turbine system, phase 1
[ALO-4272] N80-25899

AMERICAN ASSOCIATION OF COMMUNITY AND JUNIOR COLLEGES, WASHINGTON, D.C.
Community colleges and appropriate technology
[PB80-131634] N80-26220

AMERICAN SCIENCE AND ENGINEERING, INC., CAMBRIDGE, MASS.
Development of a second-generation concentrating tracking solar collector
[ASE-4480] N80-25851

AMES LAB., IOWA.
High temperature corrosion Studies. A. Iron: Based superalloy in SO2/O2 atmospheres. B. Gas: Solid reaction with formation of volatile species
[IS-T-883] N80-25430

Flux-line-cutting threshold in type-2 superconductors
[IS-T-894] N80-25493

Photoacoustic detection methods for characterizing laser irradiation and recrystallization of semiconductors
[ISM-262] N80-25552

Superconductivity in the lanthanum-yttrium-manganese alloy system
[IS-T-895] N80-25554

Oxygen reduction on a graphite paste and a catalyst loaded graphite paste electrode
[IS-T-886] N80-25898

Nuclear magnetic resonance wide-line study of hydrogen in the yttrium-yttrium dihydride system
[IS-T-877] N80-26136

ANALYTIC SCIENCES CORP., READING, MASS.
User's manual for biosphere and dose simulation program (BIODOSE)
[UCRL-15188] N80-26037

ARGONNE NATIONAL LAB., IDAHO FALLS, IDAHO.
Environmental assessments of alternative energy strategies in the United States
[CONF-791172-1] N80-25827

ARGONNE NATIONAL LAB., ILL.
Proceedings of the workshop on Stratospheric and Mesospheric Impacts of Satellite Power Systems (SPS)
[CONF-7809197] N80-25383

Effects of construction and operation of a satellite power system upon the magnetosphere
[ATR-80(7824)-1] N80-25365

Thermophysical properties of sodium
[ANL/CEN/RSD-79-1] N80-25402

Thermal conductivity measurements and molecular association in ethanol vapor
[CONF-791134-8] N80-25403

Environmental control technology for biomass flash pyrolysis
[CONF-800129-2] N80-25477

Comparison of flying compacitor bridge circuits and inductor-convertor bridge circuits for the transfer of energy between superconducting coils
[CONF-791075-4] N80-25548

Local drag laws in dispersed two-phase flow
[NUREG-CR-1230] N80-25631
Investigation leading to the development of an acoustic Doppler slurry flowmeter
[ANL/FE-49622] N80-25640
Hot cell measuring and test equipment calibration control
[CONF-791103-73] N80-25642
Development of nondestructive evaluation techniques for high-temperature ceramic heat exchange components
[ANL/MSD/FE-80-1] N80-25685
Application of reliability, maintainability, and availability engineering to solar heating and cooling systems
[CONF-800103-3] N80-25687
Measured residual stresses in type 304 stainless steel piping butt weldments
[DOE/TIC-11126] N80-25712
Design of a system using CPC collectors to collect solar energy and to produce industrial process steam
[ANL-79-102] N80-25814
World Energy Data System (WENDS). Volume 1: Country data, AF-CO
[ANL/PMS-79-2-VOL-1] N80-25827
World Energy Data System (WENDS). Volume 2: Country data, CZ-KS
[ANL/PMS-79-2-VOL-2] N80-25828
World Energy Data System (WENDS). Volume 2: Country data, LY-PO
[ANL/PMS-79-2-VOL-3] N80-25829
World energy data system (Wends). Volume 4: Country data, SG-YO
[ANL/PMS-79-2-VOL-4] N80-25830
World Energy Data System (WENDS). Volume 5: International organization data
[ANL/PMS-79-2-VOL-5] N80-25831
Reliability and maintainability evaluation of solar collector and manifold interconnections
[SOLAR/0902-79/70] N80-25886
Two-tank sensible thermal storage concept for solar space heating of buildings
[CONF-791226-2] N80-25867
Evaluation of reliability of operational solar-energy systems
[CONF-791105-2] N80-25872
Heat-pump-centered integrated community energy systems: Systems development, Consolidated Natural Gas Service Company
[ANL/CNSV/TM-29] N80-25890
Reliability, energy and cost effects of wind integration with conventional electrical generating systems
[CONF-791204-32] N80-25894
Advanced fuel cell development
[ANL-79-51] N80-25895
Consequences of increased coal utilization
[CONF-791108-16] N80-25923
Proceedings of the Workshop on Meteorological Effects of Satellite Power System Rectenna Operation and Related Microwave Transmission Problems
[CONF-7808114] N80-26004
Innate and genetic nature of circadian rhythms
[DOE/TIC-11132] N80-26036
Modified NASA-Lewis chemical equilibrium code for MHD applications
[NASA-TM-80903] N80-26162
Convective heat transfer in MHD channels and its influence on channel performance
[CONF-800104-5] N80-26166
Power take-off analysis for diagonally connected MHD channels
[CONF-800104-6] N80-26167
STARFIRE: A commerical Tokamak reactor
[ANL/FPP/TM-125] N80-26171
Polarized LEED study of surface magnetism
[CONF-790909-15] N80-26187

ARIZONA UNIV., TUCSON.
Geophysical and hydrologic prediction of fissuring and land subsidence, south-central Arizona
[PB80-151434] N80-25777
Estimating long-term statistics for annual precipitation for six regions of the United States from tree-ring data
[UCRL-15162] N80-26005

ARKANSAS UNIV., FAYETTEVILLE.
Statistical analysis of multivariate atmospheric variables
[NASA-CR-161472] N80-25991

ARMCO STEEL CORP., MIDDLETOWN, OHIO.
Hydrogen sulphide stress corrosion cracking in materials for geothermal power
[COO-2802-7] N80-25707

ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND, ST. LOUIS, MO.
Development and validation of a combined rotor fuselage induced flow field computational method
[NASA-TP-1656] N80-25296
Comparison of onboard aircraft Nicad battery chargers
[AD-A082515] N80-25540

ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND, WHITE SANDS MISSILE RANGE, N. MEX.
The 193088 MLRS, missile no. 1125, round no. V-86, 11 December 1979
[AD-A082988] N80-26000

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
A review of fabric usage in pavements constructed on low-strength soils
[AD-A083076] N80-25484
Innovations in digital image processing
[AD-A082048] N80-25639

ARMY MISSILE RESEARCH AND DEVELOPMENT COMMAND, REDSTONE ARSENAL, ALA.
Active/passive long wavelength infrared (LWIR) laser guidance
[AD-A082509] N80-25647

ARNOLD ENGINEERING DEVELOPMENT CENTER, ARNOLD AIR FORCE STATION, TENN.
MHD high performance demonstration experiment
[DOE/ET-2895/5] N80-26172

ATLAS CORP., SANTA CRUZ, CALIF.
Evaluation of the typical meteorological years for solar heating and cooling system studies
[SERI/TR-8150-1] N80-26001

AUTOMOTIVE TESTING LABS., INC., AURORA, COLO.
A study of emissions from passenger cars in six cities, volume A
[PB80-149800] N80-25930
A study of emissions from passenger cars in six cities, volume B
[PB80-149816] N80-25931

AVCO-EVERETT RESEARCH LAB., MASS.
On optical imaging through aircraft turbulent boundary layers
[AMP-334] N80-25596

AXIOMATIX, LOS ANGELES, CALIF.
Critique of the Hughes Aircraft shuttle Ku band leading edge bit synchronizer
[NASA-CR-160661] N80-25521
Shuttle Ku-band and S-band communications implementation study
[NASA-CR-160662] N80-25522

B

BALZERS AKTIENGESELLSCHAFT (LIECHTENSTEIN).
Techniques of chemical vapor deposition N80-25502
Wear resistant costings made by chemical vapour deposition N80-25508

BATTELLE COLUMBUS LABS., OHIO.
SPAR 5 experiment no. 74-30 agglomeration in immiscible liquids
[NASA-CR-161473] N80-25354
Preliminary materials assessment for the Satellite Power System (SPS)
[DOE/ER-0038] N80-25364
The development of electrochemical photovoltaic cells
[DSE-4042-T11] N80-25871
Methods for analyzing inorganic compounds in particles emitted from stationary sources
[PB80-141781] N80-25938
Evaluation of stationary source particulate measurement methods. Volume 4: Basic oxygen furnaces
[PB80-141633] N80-25937

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Thermochemical conversion of biomass: An overview of R and D activities sponsored by the biomass energy systems branch of DOE
[PNL-SA-8266] N80-25485
Collapse of experimental capsules under external pressure
[PNL-3185] N80-25705
Long-term supply curves for geothermal energy: The impacts of technology
[PNL-3072] N80-25885
Siting small wind turbines
[PNL-SA-7803] N80-25878
Research and development activities: High-level waste immobilization program
[PNL-3050-1] N80-26131
Development and characterization of solidified forms for high level wastes
[PNL-3060] N80-26132

BDM SERVICES CO., ALBUQUERQUE, N. MEX.
Conceptual design and analysis of a 100 MWe distributed line focus solar central power plant
[SAN-2073-1] N80-25826

BELL TELEPHONE LABS., INC., PHILADELPHIA, PA.
West Chester Work Center: Solar space heating demonstration project
[DOE/CS-4048/2] N80-25822

BENDIX CORP., BALTIMORE, MD.
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 1
[AD-A081233] N80-25314
Microwave Landing System (MLS), phase 3. Basic narrow small community configurations, volume 2: Appendices
[AD-A081133] N80-25315

BENDIX CORP., KANSAS CITY, MO.
Thermal fatigue evaluation of solder alloys
[BDX-613-2341] N80-25429
Failure analysis of ceramic-to-metal seals
[BDX-613-2414] N80-25449
Improving delamination resistance of multilayer printed wiring boards
[BDX-613-2413] N80-25548
Mathematical model and the dynamic simulation of an electromechanical rotary device
[BDX-613-2376] N80-25867

BERN UNIV. (SWITZERLAND).
Topoclimatological and snowhydrological survey of Switzerland
[E80-10184] N80-25739

BETTIS ATOMIC POWER LAB., WEST MIFFLIN, PA.
Finite element analysis of arc welding
[WAPD-TM-1430] N80-25673

BITUMINOUS COAL RESEARCH, INC., MONROEVILLE, PA.
Test and evaluate the TRI-GAS low Btu coal gasification process
[FE-2798-74] N80-25476

BOEING AEROSPACE CO., SEATTLE, WASH.
Solar project description for Perl-Mack Enterprises' single family residences, Denver, Colorado
[SOLAR/1015-79/50] N80-25821
Software quality assurance: One of the software acquisition engineering guidebook series
[AD-A082425] N80-26070

BOEING CO., SEATTLE, WASH.
Solar project description for A-Frame Industries' single family residence: Kaneohe, Hawaii
[SOLAR/1010-79/50] N80-25818
Solar project description. Albuquerque Western-2 multi-dwelling building Albuquerque, New Mexico
[SOLAR/1090-79/50] N80-25819

BONNEVILLE POWER ADMINISTRATION, PORTLAND, OREG.
Use of satellite data in runoff forecasting in the heavily forested, cloud-covered Pacific Northwest N80-25750

BOSTON COLL., CHESTNUT HILL, MASS.
Characterization of Titan 3-D acoustic pressure spectra by least-squares fit to theoretical model
[AD-A083021] N80-25361

BOSTON UNIV., MASS.
Photochemical determinants of the efficiency of photogalvanic conversion of solar energy
[COO-2889-5] N80-25886
A comparison of smooth empirical Bayes estimators N80-26102
A proposed solution to the Behrens-Fisher problem N80-26104
Calculations of NLTE carbon 2-4 spectra in line-blanketed model atmospheres of early-type stars N80-26225

BRITISH AEROSPACE AIRCRAFT GROUP, WEYBRIDGE (ENGLAND).
UK approach to aircraft dynamic response on damaged and repaired runways N80-25327
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
CARFAX: An example of an FM signal generated using digital techniques
[BBC-RD-1980/2] N80-25512
Digital sound: An investigation of delta-modulation/pulse-code-modulation -digital conversion
[BBC-RD-1980/3] N80-25519
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Flash hydropyrolysis of coal
[BNL-51052] N80-25468
Optimization of solar assisted heat pump systems via a simple analytic approach
[BNL-27316] N80-25896
Consequences of increased coal utilization
[CONF-791108-16] N80-25923
Transport and diffusion climatology of the US Atlantic and Gulf coasts
[BNL-26891] N80-26002
Monte Carlo simulations of lattice gauge theories
[BNL-27323] N80-26185
Development of fuel cell technology for vehicular applications
[BNL-51047] N80-26216
BROWN UNIV., PROVIDENCE, R. I.
An approximation and an associated numerical method for two-dimensional steady supersonic gas dynamics N80-25567
Two numerical methods for steady stratified shear flows over an obstacle N80-25568
Plastic creep flow effects in the diffusive cavitation of grain boundaries
[CO-3084-74] N80-25711
BUREAU OF MINES, PITTSBURGH, PA.
Dust control for a Borer-type continuous miner using a venturi scrubber on a transfer car
[PB80-144850] N80-25773
BUREAU OF MINES, SALT LAKE CITY, UTAH.
Flue gas desulfurization by the modified citrate process: Report of investigations
[PB80-134836] N80-25940

C

C-E LUMMUS, BLOOMFIELD, N.J.
Synthane pilot plant, South Park Township, Pennsylvania
[COO-0003-41-T1] N80-25455
CALIFORNIA INST. OF TECH., PASADENA.
Motion of a sphere in the presence of a plane interface, 1. Modeling of non-isothermal turbulent flows, 2 N80-25582
CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Application of snowcovered area to runoff forecasting in selected basins of the Sierra Nevada, California N80-25753
CALIFORNIA UNIV., BERKELEY.
An adaptive Bayesian scheme for estimating reliability growth under exponential failure times
[AD-A083006] N80-25683
Remote sensing analysis of water quality and the entrapment zone in the San Francisco Bay and delta
[E80-10152] N80-25734
Risk of renewable energy sources: A critique of the Inhaber report
[ERG-79-3] N80-25892
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Combustion research
[LBL-9809] N80-25400
Thermochemical conversion of biomass: An overview of R and D activities sponsored by the biomass energy systems branch of DOE
[PNL-SA-8266] N80-25465
Overlay coatings for gas turbine airfoils N80-25506
Design and application of a mega-moment electromagnetic dipole source
[LBL-9920] N80-25549
Gas-particle flow in the entry region of a curved pipe
[LBL-9905] N80-25627
Mathematical modeling of the lithium aluminum, iron sulfide battery
[LBL-10197] N80-25845
Evaluation of residential building energy performance standards
[LBL-9816] N80-25849
International analysis of residential energy use and conservation
[LBL-9383] N80-25881
Solar energy program. Chapter from the Energy and Environment Division report
[LBL-9630] N80-25904
Ocean thermal energy conversion ecological data report from OSS researcher in Gulf of Mexico, 12-23 July 1977
[LBL-8945] N80-25921
Consequences of increased coal utilization
[CONF-791108-16] N80-25923
Chemisorption and reactivity studies of small molecules on rhodium surfaces
[LBL-9471] N80-26186
CALIFORNIA UNIV., DAVIS.
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432
CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Advances in materials science
[UCRL-50058-79-3] N80-25376
Summary and review of hydrogen theoretical equation-of-state models at Lawrence Livermore Laboratory
[UCID-18489] N80-25404
Electrochemical properties of certain new ternary and quaternary alloys based on aluminum
[UCRL-TRANS-11535] N80-25431
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432
Relation between the electronic structure and the shock sensitivity of nitrated secondary explosives. 3: Influence of the crystal environment
[UCRL-TRANS-11510] N80-25458
Statistical treatment of heterogeneous chemical reaction in shock-initiated explosives
[UCID-18548] N80-25469
Elastic-wave radiation from spherical sources
[UCRL-52867] N80-25529
Study of nonlinear waves described by the cubic Schroedinger equation
[UCRL-52920] N80-25530
Brightness temperature measurements for high-energy jet propagation
[UCRL-83609] N80-25619
Prospects for generating 1-10 TPa pressures with a railgun
[UCRL-82296-REV-2] N80-25641
Laser program, volume 3
[UCRL-50021-78-VOL-3] N80-25650
Laser program, volume 2
[UCRL-50021-78-VOL-2] N80-25651
Laser program, volume 1
[UCRL-50021-78-VOL-1] N80-25652
Large scale copper vapor laser computer control system
[UCRL-82275] N80-25653
Continuously variable transmissions: Theory and practice
[UCRL-15037] N80-25668
Dynamic, inelastic buckling analysis of Mark 1 torus support columns
[NUREG-CR-1038] N80-25714
Site and building energy-conservation study: Survey of building 251, diagnostic chemistry
[UCRL-15190] N80-25880
Evaluation of air cathodes for potential use in development of aluminum-air cells
[UCID-18561] N80-25893
Solar-assisted heat pump-swimming pool synergistics for domestic heating
[UCRL-83458] N80-25905
Seismic safety margins research program load combination project. Task 3: Load combination methodology development
[UCID-18149] N80-25981
Climate program plan, volume 1
[DOE/EV-0062/1] N80-26003
Joint Gaussian probability plot program
[UCID-18513] N80-26106
Geoscience data base handbook for modeling a nuclear waste repository, volume 1
[NUREG-CR-0912-VOL-1] N80-26133
Mechanical and dielectric properties of optical films
[UCRL-15098] N80-26144
Magnetic confinement in plasmas in nuclear devices
[UCRL-82765] N80-26185
Energy-storage systems for automobile propulsion, 1979 study. Volume 3: Battery/flywheel electric vehicles using advanced batteries
[UCRL-52841-VOL-3] N80-26213
CALIFORNIA UNIV., LOS ANGELES.
High rate physical vapor deposition processes N80-25500
Applications of physical vapor deposition processes N80-25509
CALIFORNIA UNIV., RIVERSIDE.
Mechanisms of photochemical reactions in urban air
[PB80-132384] N80-25939
CALIFORNIA UNIV. AT BERKELEY.
Solar energy conversion through biophotolysis
[SAN-0034-239-T1] N80-25852
CANADA CENTRE FOR REMOTE SENSING, OTTAWA (ONTARIO).
HOMM: Soil moisture experiment
[E80-10166] N80-25741
CARNEGIE-MELLON INST. OF RESEARCH, PITTSBURGH, PA.
The structure of parallel algorithms
[AD-A081967] N80-26089
CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Design of microcomputer adaptive controllers N80-26081
Moller-Plesset electron correlation studies of atoms and small molecules N80-26120
CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
Stability of the laminar boundary layer on a blunted plate in supersonic flow N80-25292
Fourier transform infrared investigation of the structure and moisture stability of the epoxy matrix in glass-reinforced composites N80-25378
Resonance Raman spectroscopy of adsorbed species at solid-gas interfaces N80-25386
Section size effects on toughness of various cast steels N80-25410
Microstructures of structural ceramics N80-25445
Crystallization of ultra-quenched polymer glasses N80-25446
Reliability of structural systems N80-25690
Hydrogen sulphide stress corrosion cracking in materials for geothermal power
[COO-2602-7] N80-25707
Mechanical and dielectric properties of optical films
[UCRL-15098] N80-26144
CATHOLIC UNIV. OF AMERICA, WASHINGTON, D. C.
Non-Gaussian characteristics of the FDM-FM satellite baseband voice channel N80-25516
CCB/CUMALI ASSOCIATES, OAKLAND, CALIF.
Passive solar calculation methods
[DSE-5221-T1] N80-25798
CENTRE DE RECHERCHES EN PHYSIQUE DE L'ENVIRONNEMENT TERRESTRE ET PLANETAIRE, ORLEANS (FRANCE).
Contribution to the study of electrostatic and electromagnetic waves near the lower hybrid frequency in ionospheric plasma
[CRPE-NT-61] N80-26173
CENTRE DE RECHERCHES SCIENTIFIQUES ET TECHNIQUES DE L'INDUSTRIE DES FABRICATIONS METALLIQUES, BRUSSELS (BELGIUM).
Computer program for elastic analysis of piping systems with special reference to the power piping code B31.1
[MT-135] N80-25697
CHESAPEAKE RESEARCH CONSORTIUM, INC., ANNAPOLIS, MD.
Physical alterations of coastal shorelines: An analysis of Chesapeake Bay shore zone development and regulation
[PB80-149875] N80-25956

CHICAGO UNIV., ILL.
Design and application of a mega-moment electromagnetic dipole source
[LBL-8920] N80-25549
Design and test of non-evacuated solar collectors with compound parabolic concentrators
[EFI-79-42] N80-25811
CINCINNATI UNIV., OHIO.
A new approach in turbomachinery flow analysis using the finite element method N80-25331
A presentation for the deformation of a metal including the effects of strain hardening and recrystallization N80-25408
The high-temperature low cycle fatigue behavior of a near-alpha titanium alloy N80-25409
Fly ash erosion in gas turbine materials N80-25659
Inelastic strong interactions at high energies
[COO-2978-5] N80-26134
CIVIL AERONAUTICS BOARD, WASHINGTON, D.C.
Handbook of airline statistics: Supplement
[PB80-138407] N80-25309
CIVIL AVIATION AUTHORITY, REDHILL (ENGLAND).
Description of the British Civil Aviation airworthiness data recording program N80-25284
CLAREMONT MENS COLL., CALIF.
On problems of estimation for two parameter decreasing failure rate distributions applied to reliability
[AD-A082991] N80-25682
CLARKSON COLL. OF TECHNOLOGY, POTSDAM, N.Y.
Microprocessor self-diagnosis N80-26042
CLEMSON UNIV., S.C.
Investigation of reliability attributes and accelerated stress factors on terrestrial solar cells
[NASA-CR-163209] N80-25781
COLLEGE OF WILLIAM AND MARY, WILLIAMSBURG, VA.
Nonlinear evolution of the magnetohydrodynamic sheet pinch N80-26148
COLORADO DIV. OF WATER RESOURCES, DENVER.
A graphical method of stream runoff prediction from LANDSAT derived snowcover data for watersheds in the upper Rio Grande Basin of Colorado N80-25752
COLORADO STATE UNIV., FORT COLLINS.
Applications of remote sensing to emergency management
[AD-A082243] N80-25765
CSU Solar House 3: Solar heating and cooling system performance
[COO-30122-3] N80-25806
Comparative performance of two types of evacuated tubular solar collectors in a residential heating and cooling system
[COO-2577-19] N80-25864
Variability of solar radiation at four selected stations in the United States
[COO-4521-1] N80-25979
Liquid water measurements in high elevation continental cumuli
[PB80-143928] N80-26017
Satellite cloud climatological results, 1979: Comparison to 1976-77
[PB80-148117] N80-26019
Ion extraction from a plasma
[NASA-CR-159849] N80-26161
COLUMBIA UNIV., NEW YORK.
Biological and synthetic systems for production of hydrogen from water
[PB80-146269] N80-25480
Viscosity of He3 in superfluid and Fermi liquid regimes N80-25482
Application of digital analysis of MSS data to agro-environmental studies
[E80-10161] N80-25737
Numerical simulation studies of toroidal pinches
[COO-2456-57] N80-26163
Spectroscopic study of turbulent heating in the high beta Tokamak, Torus 2
[COO-2456-70] N80-26184
COMBUSTION ELECTROMAGNETICS, INC., LEXINGTON, MASS.
Effects of microwaves on the performance of internal combustion engines
[SAN-1865-T1] N80-25672
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION (U. S. SENATE).
Agreement governing the activities of states on the Moon and other celestial bodies, parts 1 and 2
[GPO-59-896] N80-26199
COMMITTEE ON SCIENCE AND TECHNOLOGY (U. S. HOUSE).
Water immersion facility Johnson Space Center
[GPO-54-508] N80-25348
COMPLETION TECHNOLOGY CO., HOUSTON, TEX.
Performance evaluation of Magma Power company's reinjection well no. 46-7 at the East Mesa KGRA, California
[SAND-79-7127] N80-25863
COMPUTATIONAL MECHANICS CONSULTANTS, KNOXVILLE, TENN.
An interaction algorithm for prediction of mean and fluctuating velocities in two-dimensional aerodynamic wake flows
[NASA-CR-3301] N80-25298
COMPUTER SCIENCES CORP., HUNTSVILLE, ALA.
Vector wind profile gust model
[NASA-CR-161474] N80-25982
Vector wind profile gust model
[NASA-CR-161475] N80-25983
CONNECTICUT UNIV., STORRS.
Methods of evaluation of potentially hazardous organics in water
[PB80-135122] N80-25406
Electrode polarization studies in hot corrosion systems
[COO-2960-4] N80-25433
CONTROL DATA CORP., ST. PAUL, MINN.
Applications of a reconfigurable array of flexible processors in intelligence information retrieval
[AD-A082324] N80-26195
CORNELL UNIV., ITHACA, N. Y.
Optical properties of metallic surfaces, small particles and composite coatings for solar energy conversion applications
[DOE/ET-20413/1] N80-26143
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA).
The testing and application of machinability criteria
[CSIR-TRANS-1457] N80-25483

D

DELAWARE UNIV., NEWARK.
Theory of thin-film photovoltaics. Non-ideal diode factors
[DOE/ET-23103] N80-25840
Theory of thin-film photovoltaics
[DOE/ET-23103/4] N80-25885
Contributions of urban land use to stream water quality
[PB80-151178] N80-25942
DEPARTMENT OF DEFENSE, WASHINGTON, D. C.
Military standard, JOVIAL (J73)
[AD-A081927] N80-26088
DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Strategic petroleum reserve
[DOE/RA-0047] N80-25769
Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161450] N80-25787
Systems engineering for power: Organizational forms for large scale systems, volume 1
[CONF-790904-P2] N80-25808
Ocean energy systems. Fiscal year 1979
[DOE/ET-0118] N80-25824
Environmental development plan: Solar agricultural and industrial process heat
[DOE/EDP-0033] N80-25862
Preliminary environmental assessment for the Satellite Power System (SPS), revision 1. Volume 1: Executive summary
[DOE/ER-0036/1] N80-25874
Solar energy project: An overview
[DOE/CS-0124] N80-25883
Photovoltaic energy systems: Program summary
[DOE/CS-0146] N80-25894
Proposed energy performance standards for new buildings: Standard building operating conditions
[DOE/CS-0118] N80-25901
Proposed energy-performance standards for new buildings: Passive and active solar-heating analysis
[DOE/CS-0117] N80-25902
Division of Environmental Control Technology program, 1978
[DOE/EV-0042] N80-25926
Environmental assessment: Geothermal energy geopressure subprogram. DOE Sweet Lake no. 1, Cameron Parish, Louisiana
[DOE/EA-0065] N80-25929
Advanced subsystems for practical electric vehicles. Electric and Hybrid Vehicle Subsystems Technology Development Program
[DOE/CS-0102/1] N80-26214
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, LOWER HUTT (NEW ZEALAND).
Mapping New Zealand and Antarctic snowpack from LANDSAT N80-25746
DETROIT DIESEL ALLISON, INDIANAPOLIS, IND.
Experimental determination of unsteady blade element aerodynamics in cascades. Volume 1: Torsion mode cascade
[NASA-CR-159831] N80-25325
High bypass turbofan component development. Phase 1: Fan detail design
[AD-A082821] N80-25336
Gas turbine engines and transmissions for bus demonstration programs
[COO-4867-05] N80-26215
DETROIT UNIV., MICH.
Phenomenological study on reinforcement of elastomers N80-25447
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (WEST GERMANY).
Aircraft integrated data systems
[DFVLR-MITT-79-03] N80-25275
Experiences with a Flying Data Recording System (FRDS) in a German airforce fighter bomber wing after a troop 'tail N80-25276
The SYDAS flight data processing system N80-25285
The reconstruction of flight paths from AIDS-data with the aid of modern filtering methods N80-25288
Processing of AIDS flight recorder data for a quick-look with the aid of a hybrid system N80-25290
Experimental investigation of the particle-number concentration in the wind tunnel for use of the laser anemometry
[DFVLR-FB-79-28] N80-25352
Optimization of noise barriers
[DFVLR-FB-79-29] N80-26116
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE (WEST GERMANY).
Linear-elastic and elastic-plastic fracture mechanics of structural materials
[DFVLR-FB-79-31] N80-25717
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN (WEST GERMANY).
Unsteady pressure measurements at stall and buffeting
[DFVLR-MITT-79-09] N80-25300
Hypersonic slip-flow around slender elliptic cones at a slight angle of attack
[DFVLR-FB-79-21] N80-25301
Drag measurements of conical afterbodies at subsonic and transonic speeds
[DFVLR-FB-79-27] N80-25302
Windtunnel tests of a tubular supersonic inlet for projectiles
[DFVLR-FB-79-26] N80-25357
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, OBERPFAFFENHOFEN (WEST GERMANY).
Colored measurement noise digital prefiltering by averaging
[DFVLR-MITT-79-08] N80-25316
A method of producing analytical orbit models for geostationary satellites
[DFVLR-FB-79-16] N80-25366
The Precipitation Enhancement Project (PEP)
[DFVLR-MITT-79-12] N80-26006
DEVELOPMENT PLANNING AND RESEARCH ASSOCIATES, INC., MANHATTAN, KANS.
Wind energy applications in agriculture: Executive summary
[DOE/SEA-1109-20401-79/2] N80-25807
DORTMUND UNIV. (WEST GERMANY).
Sprayed coatings N80-25503

Applications of sprayed coatings N80-25507

DREXEL UNIV., PHILADELPHIA, PA.
Numerical computations of friction and heat transfer in free swirling pipe flow N80-25570
Feasibility studies for light scattering experiments to determine the velocity relaxation of small particles in a fluid
[NASA-CR-163214] N80-25586

DU PONT DE NEMOURS (E. I.) AND CO., AIKEN, S. C.
Notch and hydrogen effects on sensitized 21-6-9 stainless steel
[DP-MS-79-22] N80-25422
Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-64] N80-25429
Computer control for a cladding thickness tester
[DP-1537] N80-25645

DUKE UNIV., DURHAM, N. C.
Characterization of fatigue damage mechanisms in continuous fiber reinforced metal matrix composites N80-25379
Adaptive MSE estimation algorithms N80-26047
Performance comparisons of several adaptive least mean square algorithms N80-26051

DYNATECH R/D CO., CAMBRIDGE, MASS.
Liquid fuels production from biomass, no. 7
[COO-4366-7] N80-25462

E

ECOSYSTEMS INTERNATIONAL, INC., GAITHERSBURG, MD.
Cost/benefit analysis for the Operational Applications of Satellite Snowcover Observations (OASSO) N80-25756

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
Thermo-mechanical process for treatment of welds
[CONF-800316-2] N80-25423

EIC, INC., NEWTON, MASS.
New electrolytes for direct methane fuel cells
[DOE/ET-11321/T1] N80-25891

EIKONIX CORP., BURLINGTON, MASS.
Technology assessment: The impact of robots
[PB80-142268] N80-26041

ELECTRIC STORAGE BATTERY CO., YARDLEY, PA.
Research, development and demonstration of lead-acid batteries for electric vehicle propulsion
[ANL/OEPM-78-8] N80-25801

ENCOTH CORP., PRINCETON, N.J.
Steady state Boltzmann equation solution by numerical relaxation
[DOE/ET-15422/T3] N80-26095

ENVIRONMENTAL MEASUREMENTS, INC., SAN FRANCISCO, CALIF.
Cross-country urban and rural measurements of NOx and SO2
[PB80-137227] N80-25955

ENVIRONMENTAL MONITORING AND SUPPORT LAB., RESEARCH TRIANGLE PARK, N. C.
Transfer standards for the calibration of ambient air monitoring analyzers for ozone: Technical assistance document
[PB80-146871] N80-25941
Air quality data for metals, 1976, from the National Air Surveillance Networks
[PB80-147432] N80-25951
Measurement of perchloroethylene in ambient air
[PB80-144678] N80-25953
Test methods to determine the mercury emissions from sludge incineration plants
[PB80-144611] N80-25954

ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
National Emissions Data System (NEDS), fuel use report
[PB80-146905] N80-25919

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Compliance status of major air pollution facilities
[PB80-154560] N80-25952

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., CONCORD, MASS.
The evolution of satellite snow mapping with emphasis on the use of LANDSAT in the snow ASUT study areas N80-25743

ENVIRONMENTAL SCIENCES RESEARCH LAB., RESEARCH TRIANGLE PARK, N.C.
Biogenic hydrocarbon contribution to the ambient air of selected areas - Tulsa; Great Smokey Mountains; Rio Blanco County, Colorado
[PB80-139086] N80-25945

EUROPEAN SPACE AGENCY, PARIS (FRANCE).
Mechanical modeling of microstructural instabilities in cyclic viscoplasticity at variable temperatures
[ESA-TT-611] N80-25718
La Recherche Aerospatiale, Bimonthly Bulletin Number 1979-6
[ESA-TT-632] N80-26255

EXXON RESEARCH AND ENGINEERING CO., BAYTON, TEX.
Consequences of the mass spectrometric and infrared analysis of oils and asphaltenes for the chemistry of coal liquefaction. Characterization of coal-derived liquids and other fossil fuel related materials employing mass spectrometry
[FE-2537-10] N80-25480

EXXON RESEARCH AND ENGINEERING CO., FLORHAM PARK, N.J.
EDS coal liquefaction process development, phase 4
[FE-2893-33] N80-25474
EDS coal liquefaction process development, phase 4. EDS commercial plant study design update, offsite design basis: Illinois coal market flexibility sensitivity case
[FE-2893-37] N80-25475

F

FEDERAL AVIATION ADMINISTRATION, ATLANTIC CITY, N.J.
Radar Microwave Link (RML) electromagnetic compatibility measurements
[AD-A083072] N80-25523

FIAT RESEARCH CENTER, ORBASSANO (ITALY).
Laser surface alloying N80-25504

FIAT RESEARCH CENTER, TURIN, ITALY.
Electrochemical energy storage on board of road electric vehicles N80-26211

FORD AEROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIF.
Measurement of external forces and torques on a large pointing system N80-25610

G

GARRETT ENERGY RESEARCH AND ENGINEERING, INC., CLAREMONT, CALIF.
Conversion of biomass materials into gaseous products. Operation of the POU
[SAN-1241-3] N80-25488

GENERAL ACCOUNTING OFFICE, WASHINGTON, D. C.
A decision by the Secretary of Defense is needed on the AV-8B aircraft program
[PB80-143209] N80-25291
F/A-18 naval strike fighter: Its effectiveness is uncertain
[PB80-143225] N80-25324
Magnetohydrodynamics: A promising technology for efficiently generating electricity from coal, report to the Congress
[PB80-143175] N80-25910

GENERAL ATOMIC CO., SAN DIEGO, CALIF.
Incremental stress-strain law for graphite under multiaxial loadings
[GA-A-15573] N80-25704
Algorithm to integrate systems of nonlinear ordinary differential equations, with application to the advanced Fiper code
[GA-A-15143] N80-26096
STARFIRE: A commerical Tokamak reactor
[ANL/FPP/TM-125] N80-26171

GENERAL DYNAMICS/ELECTRONICS, SAN DIEGO, CALIF.
Wave propagation through axially-symmetric dielectric shells
[AD-A082378] N80-25524

GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Determination of the effects of ambient conditions on CFM56 aircraft engine emissions
[PB80-138597] N80-25944

GENERAL ELECTRIC CO., LYNN, MASS.
High bypass turbofan component development. Phase 2: Detailed design
[AD-A082753] N80-25341

GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Study of advanced communications satellite systems based on SS-FDMA
[NASA-CR-159778] N80-25357
Solar heater program: Solar applications study
[COO-2705-3] N80-25813
Solar total energy project Shenandoah
[ALO-3985-1-REV-1] N80-25825
Requirement definition and preliminary design of a photovoltaic central power station experimental test facility
[SAND-79-7022-VOL-1] N80-25870

GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
Laminar flow cyclone development program
[FE-3242-6] N80-25622
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies
[NASA-CR-163227] N80-26203
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies
[NASA-CR-163228] N80-26204
Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings
[NASA-CR-163229] N80-26205
Near-term hybrid vehicle program, phase 1
[NASA-CR-163230] N80-26206
Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report
[NASA-CR-163231] N80-26207
Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package
[NASA-CR-163232] N80-26208
Near-term hybrid vehicle program, phase 1. Appendix D: Sensitivity analysis report
[NASA-CR-163233] N80-26209

GENERAL SERVICES ADMINISTRATION, WASHINGTON, D.C.
CII Honeywell Bull COBOL V-60.124-4
[PB80-146012] N80-26080

GEOLOGICAL SURVEY, DENVER, COLO.
Geologic application of thermal-inertia mapping from satellite
[E80-10151] N80-25733

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Seismic engineering program
[PB80-149909] N80-25984
The torsional pendulum test for soils: A theoretical investigation
[PB80-154115] N80-25985

GEOLOGICAL SURVEY, PHOENIX, ARIZ.
Satellite snowcover and runoff monitoring in central Arizona N80-25749

GEOLOGICAL SURVEY, RESTON, VA.
U.S. geological survey sources of photographs and images of biosphere reserves taken from spacecraft and aircraft, Sequoia, Kings, Canyon National Park, California. Project no. 8: Conservation of natural areas and of the genetic material they contain
[PB80-147291] N80-25775

GEORGE WASHINGTON UNIV., WASHINGTON, D. C.
An adaptive Bayesian scheme for estimating reliability growth under exponential failure times
[AD-A083006] N80-25683

GEORGIA INST. OF TECH., ATLANTA.
Photovoltaic system costs using local labor and materials in developing countries
[NASA-CR-163218] N80-25785

GEORGIA UNIV., ATHENS.
Development of a practical photochemical energy storage system. The norbornadiene-quadricyclene energy storage system
[SRO-0893-17] N80-25889

GEOTECHNICAL ENGINEERS, INC., WINCHESTER, MASS.
Geoscience data base handbook for modeling a nuclear waste repository, volume 1
[NUREG-CR-0912-VOL-1] N80-26133

GILLILAND-BELL ASSOCIATES, INC., GREENWOOD, S.C.
Solar heating and hot water system installed at Municipal Building complex, Abbeville, South Carolina
[NASA-CR-161443] N80-25788

GOODRICH (B. F.) CO., BRECKSVILLE, OHIO.
Evaluation of nondestructive inspection methods for aircraft tires
[AD-A082523] N80-25881

GOULD, INC., ROLLING MEADOWS, ILL.
Research, development and demonstration of nickel-zinc batteries for electric vehicle propulsion
[ANL/OEPM-79-11] N80-25802

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Transonic flow field analysis for wing-fuselage configurations
[NASA-CR-3243] N80-25295

GTE LABS., INC., WALTHAM, MASS.
Development of materials for a luminescent solar collector
[COO-4996-1] N80-25812

GULF RESEARCH AND DEVELOPMENT CO., PITTSBURGH, PA.
Research and development of an advanced process for conversion of coal to synthetic gasoline and other distillate motor fuels
[FE-1800-42] N80-25473

GULF SOUTH RESEARCH INST., NEW ORLEANS, LA.
Research to identify components of energy-related wastes: A state-of-the-art report
[PB80-137961] N80-25843

H

HAMILTON STANDARD, WINDSOR LOCKS, CONN.
Diffusion bonded boron/aluminum spar-shell fan blade
[NASA-CR-159571] N80-25382

HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
The effect of crack length and side grooves on the ductile fracture toughness properties of ASTM A533 steel
[NUREG-CR-1171] N80-25709
Tensile properties of irradiated and unirradiated welds of A533 steel plate and A508 forgings
[NUREG-CR-1158] N80-25710

HAWAII UNIV., HONOLULU.
Characteristics of the winter monsoon over the Malaysian region N80-25887
Geological and geotechnical investigation of sediment redistribution on the central equatorial Pacific seafloor N80-26021

HAZLETON-NUCLEAR SCIENCE CORP., PALO ALTO, CALIF.
New mathematical technique for determining the parameters of gas permeation through solids
[GEPP-OP-474] N80-25821

HONEYWELL SYSTEMS AND RESEARCH CENTER, MINNEAPOLIS, MINN.
Selective paint development
[ALO-4287-T2] N80-25448

HOUSTON UNIV., TEX.
Reaction rate self-oscillations during the oxidation of hydrogen over nickel N80-25390
Natural convective heat transfer in trapezoidal enclosures N80-25573
The dynamic analysis of high-speed flexible cam mechanisms N80-25658

HOWARD UNIV., WASHINGTON, D. C.
Apodization of optical systems with poor resolving power N80-26139

HUGHES AIRCRAFT CO., FULLERTON, CALIF.
Nanosecond pulsers for MM wave tubes
[AD-A080990] N80-25541
Nanosecond pulsers for MM wave tubes
[AD-A080966] N80-25542

HUGHES RESEARCH LABS., MALIBU, CALIF.
Infrared fiber optics
[AD-A082450] N80-26141
Microwave fiber optics delay line
[AD-A082505] N80-26142

I

IBM FEDERAL SYSTEMS DIV., HUNTSVILLE, ALA.
Solar energy system performance evaluation: Seasonal report for Decade 80 House, Tucson, Arizona
[NASA-CR-161460] N80-25787
Solar energy system performance evaluation: Seasonal report for IBM system 1A, Huntsville, Alabama
[NASA-CR-161464] N80-25790
Solar energy system performance evaluation: Seasonal report for Solaron-Akron, Akron, Ohio
[NASA-CR-161465] N80-25791

IBM NORWAY, OSLO.
Application of satellite data for snow mapping in Norway N80-25748

IIT RESEARCH INST., CHICAGO, ILL.
Thermal fatigue and oxidation data of oxide dispersion-strengthened alloys
[NASA-CR-159842] N80-25415

ILLINOIS UNIV. AT URBANA-CHAMPAIGN.
Browsing in large data bases
[AD-A081987] N80-26194

ILLINOIS UNIV., URBANA.
Anelastic studies of interstitially trapped hydrogen in niobium
[DOE/ER-01198/1299] N80-25427
Improving the performance and fuel consumption of dual chamber stratified charge spark ignition engines
[COO-4493-5] N80-25689
Rocket measurements of electron temperature in the E region
[NASA-CR-163210] N80-25964
Phonon-dislocation interaction
[COO-1198-1281] N80-26129
Rocket observations of solar radiation during the eclipse of 26 February 1979
[NASA-CR-163211] N80-26242

INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Preparation of a coal conversion systems technical data book
[FE-2286-44] N80-25472
Beneficial use of rejected heat from electric power plants
[COO-4531-9] N80-25841
Fuel cell research on second-generation molten-carbonate systems
[SAN-11276-1] N80-25847
Heat-pump-centered integrated community energy systems: Systems development, Consolidated Natural Gas Service Company
[ANL/CNSV/TM-29] N80-25890

INSTITUTO DE PESQUISAS ESPACIAIS, SAO JOSE DOS CAMPOS (BRAZIL).
The electrostatic potential of an equatorial satellite
[INPE-1749-RPE/142-REV] N80-25359
The impurity resitivity of In doped CdS
[INPE-1685-RPE/116-REV] N80-25391
On the efficiency of meridional eddy transport processes during the major stratospheric warming of January 1977
[INPE-1687-RPE/118] N80-25968
Longitudinal and latitudinal abnormalities in the daily variation of f0F2 in the South American region
[INPE-1722-RPE/127] N80-25969
Comparison of f0F2 characteristics at nearby equatorial locations in the South American region
[INPE-1737-RPE/136] N80-25970
Examination of the empirical flux-profile models in the atmospheric surface boundary layer
[INPE-1747-RPE/140] N80-25971
Association between plasma bubble irregularities and airglow disturbances over Brazilian low latitudes
[INPE-1748-RPE/141] N80-25972
Magnetopause reconnection
[INPE-1667-RPE/106] N80-25973
On the momentum transport by the stationary waves forced by the topography
[INPE-1720-RPE/125] N80-25990
Thermodynamic properties of extended Hubbard model with strong intraatomic attraction and arbitrary electron density
[INPE-1726-NTE/158-REV] N80-26124
Eigenvalues for unstable resonators with slightly misaligned strip mirrors
[INPE-1738-RPE/137-REV] N80-26140
Effect of ion dynamics on relativistic nonlinear plasma oscillations
[INPE-1704-RPE/122-REV] N80-26151
Relativistic nonlinear cyclotron waves in a hot electron-ion plasma
[INPE-1723-RPE/128-REV] N80-26152
Two-dimensional equilibrium of field-reversed ion rings
[INPE-1724-RPE/129-REV] N80-26153
Formation and transformation of polytypes in MX2 compounds
[INPE-1735-RPE/135] N80-26177
A calculation of the pressure dependent energy bands of CuCl
[INPE-1674-RPE/109] N80-26178
Aspects of solar wind theories
[INPE 1636-RPE/095] N80-26243
Maximum entropy spectral analysis of geomagnetic disturbing indices
[INPE-1693-RPE/120-REV] N80-26253
Nuclear gamma ray lines from supernovae
[INPE-1685-RPE/105] N80-26254

INSTITUTO DE PESQUISAS ESPACIAIS, SAO PAULO (BRAZIL).
Heating a fluid in full flow inside a horizontal cyclindrical pipe using solar energy
[INPE-1680-TDL/020] N80-25796
Meterological effects on air pollution in Sao Paulo
[INPE-1669-RPE/107] N80-25914
Spaced lidar and nightglow observations of an almospheric sodium enhancement
[INPE-1675-RPE/110] N80-25974
Equatorial counterelectrojet: Two distinct categories
[INPE-1683-RPE/114] N80-25975
Some observed and theoretical aspects of the sudden stratospheric heating in the Northern and Southern Hemispheres
[INPE-1671-TDL/016] N80-25976
Technical note APT/WEFAX 79-W2
[INPE-1727-NTE/159] N80-25995
Numerical weather prediction and its outlook in Brazil
[INPE-1670-RPE/108] N80-25996
A hydrometeorological model for medium sized hydrographic basins
[INPE-1729-TDL/025] N80-25997
A climatological study of the wind and temperature fields for the upper levels over South America
[INPE-1672-TDL/017] N80-25998
Introduction to interpreting satellite imagery
[INPE-1681-RPE/113] N80-25999
Using representative knowledge to guide decision making in automatic diagnostic systems
[INPE-1686-RPE/117-REV] N80-26033
NDTRAN: Interpreter of dynamic systems N80-26058
Algorithms for sample classification and image feature selection
[INPE-1718-RPE/124] N80-26059
Partitioning multispectral imagery of the Earth resources
[INPE-1678-RPE/111] N80-26060
A language for simulating dynamic hierarchical systems
[INPE-1728-TDL/024] N80-26061
A direct search procedure using linear programming to generate numerical suboptimal solutions in control problems
[INPE-1725-RPE/130] N80-26062
LANAC: A high level language for data acquisition and process control by minicomputers
[INPE-1721-RPE/126] N80-26063
The use of negative feedback and convolution integral in the control of nonlinear instability
[INPE-1733-RPE/133-REV] N80-26083
Optimal linear estimation applied to generate suboptimal numerical solutions for control problems
[INPE-1731-RPE/131] N80-26084
Suboptimal approximations for control in optimal dynamic programs
[INPE-1676-TDL/019] N80-26086
Mathematical methods in physics: Tensor analysis 3
[INPE-1648-RPE/102-REV] N80-26088
Radiative and nonradiative recombination times in semconducting films
[INPE-1679-RPE/112] N80-26179

Roles of the lower and upper Hubbard bands and the donor-excitonic states in the theory of shallow impurity states in doped semiconductors
[INPE-1684-RPE/115] N80-26180

Analysis of the uncertainties associated with cost estimation
[INPE-1692-TDL/022] N80-26197

INTERNATIONAL BUSINESS MACHINES CORP., GAITHERSBURG, MD.

Solar energy system performance evaluation. Albuquerque Western no. 1, Albuquerque, New Mexico
[SOLAR/1011-79/14] N80-25816

Solar energy performance evaluation. Zien Mechanical Contractors no. 1: Single-family residence, Milwaukee, Wisconsin
[SOLAR/1057-79/14] N80-25820

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS, LAXENBURG (AUSTRIA).

Hydrological and ecological models of shallow lakes and reservoirs
[IIASA-CP-78-14] N80-25720

Discussion of questions related to hydrophysical and ecological modeling of shallow lakes and reservoirs N80-25721

The role of iron and calcium in the cycling of phosphates in shallow lakes N80-25722

The prediction of solutions to management and engineering problems related to the eutrophication of bodies of water N80-25723

Two examples of the use of hydrodynamic models in ecological studies N80-25724

The modeling of aquatic ecosystems of shallow lakes exchanging matter with sediment and with neighboring bodies of water N80-25725

Development and verification of a model for predicting eutrophication trends in Czechoslovakia N80-25726

The modeling of nutrient exchange between sediment and water N80-25727

Simulation model of an oligotrophic lake N80-25728

Evaluation of available phosphorus models N80-25729

Theoretical investigations into the development of an intensively used shallow lake with a river flowing into it N80-25730

Eutrophication modeling efforts for Lake Balaton N80-25731

Use of chlorophyll/Secchi Disk relationships N80-25732

IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES.

A two-dimensional unsteady Euler equation solver for flows in arbitrarily shaped regions using a modular concept N80-25293

Boiling heat transfer and critical heat flux in helical coils N80-25576

Simulation of chemical reaction in a turbulent flow [ISM-253] N80-25620

IOWA UNIV., IOWA CITY.

Development of the finite-differential numerical method and its application in two-dimensional Navier-Stokes equations N80-25583

Two sample location and scale tests for distributions with the same finite interval of support N80-26103

A theoretical and experimental investigation of the effects of the interaction between an acoustic field and cylindrical structure on sound transmission loss N80-26114

Nuclear interactions of low energy lithium ions [COO-10409-1] N80-26137

Milliarcsecond structure of nine compact extragalactic sources at 1671 MHz N80-26233

ITT ELECTRO-OPTICAL PRODUCTS DIV., ROANOKE, VA.

Study of the effects of bending and microbending on glass fibers
[AD-A081239] N80-25702

Study of dynamic effects on glass fibers
[AD-A081238] N80-25703

J

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.

Stark effect spectrophone for continuous absorption spectra monitoring
[NASA-CASE-NPO-15102-1] N80-25538

Hermetic seal for a shaft
[NASA-CASE-NPO-15115-1] N80-25660

Economic baselines for current underground coal mining technology
[NASA-CR-163259] N80-25764

Thermoelectric generator testing and RTG degradation mechanisms evaluation
[SAN-0959-T2] N80-25809

An application of software design and documentation language
[NASA-CR-163258] N80-26057

Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies
[NASA-CR-163227] N80-26203

Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 2: Supplement to design trade-off studies
[NASA-CR-163228] N80-26204

Near-term hybrid vehicle program, phase 1. Appendix B: Design trade-off studies report. Volume 3: Computer program listings
[NASA-CR-163229] N80-26205

Near-term hybrid vehicle program, phase 1
[NASA-CR-163230] N80-26206

Near-term hybrid vehicle program, phase 1. Appendix A: Mission analysis and performance specification studies report
[NASA-CR-163231] N80-26207

Near-term hybrid vehicle program, phase 1. Appendix C: Preliminary design data package
[NASA-CR-163232] N80-26208

Near-term hybrid vehicle program, phase 1. Appendix D: Sensitivity analysis report
[NASA-CR-163233] N80-26209

Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210

Images of Mars: The Viking extended mission
[NASA-SP-444] N80-26239

K

KAPPA SYSTEMS, INC., ARLINGTON, VA.

Clearinghouse and information resources offering utility-related products and services
[DOE/RG-10019/T1] N80-26196

KARLSRUHE UNIV. (WEST GERMANY).

Classification of operating conditions of turbomachines from solid borne sound N80-25282

KLM ROYAL DUTCH AIRLINES, AMSTERDAM (NETHERLANDS).

The use of AIDS data at KLM N80-25286

L

LABORATOIRE CENTRAL DES PONTS ET CHAUSSEES, PARIS (FRANCE).

The application of holography to stress analysis
[LPC-84] N80-25715

Stability, toughness, and crack propagation in steel wires and bars
[LPC-89] N80-25716

LEHIGH UNIV., BETHLEHEM, PA.

Sudden stretching of a four layered composite plate
[NASA-CR-159870] N80-25383

Sudden bending of cracked laminates
[NASA-CR-159660] N80-25384

LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.

Wideband adaptive antenna nulling using tapped delay lines
[AD-A082854] N80-25527

A simple graphical model for analyzing radar homing interceptor engagements
[AD-A082460] N80-25528

Optical measurements of degradation in aircraft boundary layers N80-25603

LOCKHEED-CALIFORNIA CO., BURBANK.

Investigation of the mechanical and corrosion properties of MA-87 aluminum powder alloy
[AD-A082457] N80-25418

LOCKHEED ENGINEERING AND MANAGEMENT SERVICES CO., INC., HOUSTON, TEX.

Computer program documentation modified version of the JA70 aerodynamic heating computer program H800 (MINIVER with a DISSPLA plot package
[NASA-CR-160695] N80-26064

As-built design specification of the data order processor ORDHDT
[NASA-CR-160694] N80-26065

LOCKHEED-GEORGIA CO., MARIETTA.

Exploratory studies of the cruise performance of upper surface blown configurations. Experimental program: Test facilities, model design instrumentation, and lowspeed, high-lift tests
[NASA-CR-3182] N80-25297

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.

Amorphous thin films for solar cell application
[DOE/ET-23040/1] N80-25882

LOGOS DEVELOPMENT CORP., MIDDLETOWN, N. Y.

Development of Logoscan 2
[AD-A081921] N80-26067

LOS ALAMOS SCIENTIFIC LAB., N. MEX.

Model of burning and detonation in rocket motors
[LA-8141-MS] N80-25374

Theoretical equations of state for the rare gases
[LA-8062] N80-25396

Liquid hydrogen-fueled vehicle project
[LA-UR-79-2883] N80-25467

Magnetic refrigeration for space applications: Report on a design study
[LA-8134] N80-25492

Introduction to detonation phenomena
[LA-UR-79-2880] N80-25625

Short-pulse CO2-laser damage studies of NaCl and KCl windows
[LA-UR-80-108] N80-25649

Effect of nonlinear refraction on beam brightness in laser fusion applications
[LA-UR-80-417] N80-25655

Image processing applications in NDE
[LA-UR-80-172] N80-25686

Superconducting Magnetic Energy Storage (SMES) program
[LA-8199-PR] N80-25805

High temperature hydrogen cycles for solar heat sources
[LA-UR-80-184] N80-25817

Effects of rocket exhaust products in the thermosphere and ionosphere
[LA-8233-MS] N80-25822

Consequences of increased coal utilization
[CONF-791108-16] N80-25923

Proceedings of the Atmospheric Tracers and Tracer Application Workshop
[LA-8144-C] N80-25980

Optical mixing as a plasma diagnostic
[LA-8262-MS] N80-26170

Electronic structure, bonding and chemisorption in metallic hydrides
[LA-UR-80-458] N80-26184

Renormalizing the strong-coupling expansion for quantum field theory: Present status
[LA-UR-80-432] N80-26191

Light curves of type I supernovae
[LA-UR-80-463] N80-26232

LOUISIANA STATE UNIV. AND A&M COLL., BATON ROUGE.

Measurement and correlation of molecular metal pollutants in the air to existing weather conditions. Development of carbon atomizers for atomic absorption with high sensitivity and metal speciation capability N80-25913

Measurement of the mechanical impedance of human soft tissue in vivo N80-26031

LOVELACE FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH, ALBUQUERQUE, N. MEX.

Development of an automated stress/duress detection system, phase 1 and phase 2
[SAND-79-7038] N80-26036

LUMMUS CO., BLOOMFIELD, N. J.

Developmental research program for clean industrial and transportation fuels from coal: Milestone report on comparison of catalysts, March 1979
[FE-2514-M4] N80-25471

M

MAINE UNIV., ORONO.

Spectrum of acoustic waves excited in single and multiple layered crystaline media N80-26174

MARTIN MARIETTA AEROSPACE, NEW ORLEANS, LA.
Study of etchants for corrosion-resistant metals, space shuttle external tank
[NASA-CR-161431] N80-25414
MARTIN MARIETTA CORP., BALTIMORE, MD.
Modeling of buoyant plume dispersion in complex terrain
[PB80-145337] N80-25939
MARYLAND UNIV., COLLEGE PARK.
A medial axis transformation for grayscale pictures
[AD-A081347] N80-25636
Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T2] N80-25853
Read only memory optimization for microprogrammed digital computers N80-26044
Solid state crystal physics at very low temperatures
[NASA-CR-163240] N80-26181
On the physical environment in galactic nuclei N80-26234
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Alloy development for irradiation performance in fusion reactors
[COO-5099] N80-25426
Constitutive equations for polymers undergoing changes in microstructure with deformation N80-25443
Interfacial tension theory for low molecular weight and polymer systems N80-25444
Critical studies of the rapid pyrolysis and hydropyrolysis of coal
[FE-MIT-2295T28-9] N80-25459
Particle-initiated breakdown in gas dielectric cable insulation expanded scope program
[EPRI-EL-1264] N80-25553
Microcrack technology
[DOE/ER-04872/2] N80-25713
MASSACHUSETTS UNIV., AMHERST.
Low-temperature helium embrittlement of tritium-charged stainless steel
[DP-MS-79-64] N80-25429
Frictional damping at unlubricated metallic interfaces N80-25657
Experimental investigation of gas flow dynamics of an inductively coupled argon plasma N80-26146
Surface photometry of the Coma Cluster of galaxies N80-26223
MATHEMATICAL SCIENCES NORTHWEST, INC., BELLEVUE, WASH.
Axial laser heating of three meter theta pinch plasma
[MSNW-79-1045-5] N80-26169
MCDONNELL AIRCRAFT CO., ST. LOUIS, MO.
Prediction of optical propagation losses through turbulent boundary/shear layers N80-25595
MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
Cleaning agents and techniques for concentrating solar collectors
[SAND-80-7005C] N80-25880
MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
STARFIRE: A commerical Tokamak reactor
[ANL/FPP/TM-125] N80-26171
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., HAMBURG (WEST GERMANY).
An Automatic Fault Indentification System (AFIS) on board N80-25289
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH (WEST GERMANY).
Parameters affecting aircraft performance on runways in bad condition N80-25328
Corrosion protection by electro-deposited aluminum N80-25505
METEOROLOGY RESEARCH, INC., ALTADENA, CALIF.
Pollutant measurements in plumes from power plants and cities - St. Louis area, July 1976. A project MISTT (midwest sulfur transformation and transport) report
[PB80-139058] N80-25935
MIAMI UNIV., CORAL GABLES, FLA.
Coastal upwelling ecosystems analysis. Physical dynamics of the coastal upwelling frontal zone off Oregon
[PB80-139643] N80-26024
MICHIGAN STATE UNIV., EAST LANSING.
Residual stress factors in torsional failure modes of inductionhardened steel axle shafts N80-25689
Permanent deformation of cohesionless subgrade material under cyclic loading N80-25692
MICHIGAN UNIV., ANN ARBOR.
Funding for highway safety research, development, and demonstration in the National Highway Traffic Safety Administration
[PB80-137672] N80-26200
MIDWEST RESEARCH INST., GOLDEN, COLO.
Problems and opportunities for solar energy in biomass, pyrolysis, and gasification
[SERI/TP-332-495] N80-25810
Solar technology application to enhanced oil recovery
[SERI/TR-352-392] N80-25839
The development of electrochemical photovoltaic cells
[DSE-4042-T11] N80-25871
Analysis of community solar systems for combined space and domestic hot water heating using annual cycle thermal energy storage
[SERI/TP-355-570] N80-25900
Environmental assessment of small wind systems
[SERI/PR-354-420] N80-25928
Evaluation of the typical meteorological years for solar heating and cooling system studies
[SERI/TR-8150-1] N80-26001
MINICARS, INC., GOLETA, CALIF.
Near hybrid passenger vehicle development program, phase 1. Appendices A and B. Mission analysis and performance specification studies report, volume 1
[NASA-CR-163330] N80-26201
Near hybrid passenger vehicle development program, phase 1. Appendices C and D, Volume 2
[NASA-CR-163331] N80-26202
Near term hybrid passenger vehicle development program, phase 1
[NASA-CR-163235] N80-26210
MINNESOTA UNIV., MINNEAPOLIS.
Sputtering of multicomponent surfaces: Surface composition changes under ion bombardment and angular ejection distributions of sputtered species N80-25411
Heat transfer to staggered arrays of impinging circular air jets N80-25571
A coordinate transformation method for solving a convection phase change problem N80-25572
Computerized adaptive performance evaluation
[AD-A082845] N80-26085
The origin and relationship of the radio, infrared and visual radiation from compact nonthermal sources N80-26249
The isotopic composition of cosmic rays N80-26250
MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
Application of remote sensing to state and regional problems
[E80-10153] N80-25735
A comparison of finite difference methods for solving Laplace's equation on curvilinear coordinate systems
[NASA-CR-163236] N80-26089
MISSISSIPPI STATE UNIV., STATE COLLEGE.
Numerical solution of the incompressible Navier-Stokes equations about a three-dimensional body using boundary-fitted coordinates N80-25577
MISSOURI UNIV. - COLUMBIA.
Inherent error in asynchronous digital flight controls
[AD-A082622] N80-25346
Relationship of the geometry of the observed steady state chemical conversion rate to the basic surface reaction process in electrochemistry
[ISM-243] N80-25397
MITRE CORP., HOUSTON, TEX.
Some queuing network models of computer systems
[NASA-CR-160693] N80-26082
MONSANTO RESEARCH CORP., DAYTON, OHIO.
Superior heat transfer fluids for solar heating and cooling applications
[ALO-35356-1] N80-25815
MONTANA ENERGY AND MHD RESEARCH AND DEVELOPMENT INST., INC., BUTTE.
High-temperature fuel cell research and development
[SAN-1485-T1] N80-25848
High temperature fuel cell research and development
[SAN-1485-2] N80-25848
MONTANA STATE UNIV., BOZEMAN.
Catalytic hydrogenation of coal-derived liquids
[FE-2034-17] N80-25398
MOTOROLA, INC., PHOENIX, ARIZ.
Thin film polycrystalline silicon solar cells
[SAN-2207-3] N80-25844
MOUND LAB., MIAMISBURG, OHIO.
Use of mass spectroscopy for contamination control
[MLM-2896] N80-25405
Bulk polymerization and stability of anaerobic adhesives
[MLM-2847] N80-25450

N

NAGOYA UNIV. (JAPAN).
New type of ray trajectory of thermal mode in an inhomogeneous magnetoplasma
[IPPJ-447] N80-26154
A disc LaB6 cathode for plasma production in magnetic field
[IPPJ-448] N80-26155
Nonlinear Alfven wave in an ultra-relativistic electron-positron plasma
[IPPJ-449] N80-26156
Waves in an ultra-relativistic electron-positron plasma
[IPPJ-450] N80-26157
Negative shear ferromak for stabilization of current disruptions in toroidal discharge
[IPPJ-451] N80-26158
A quick start of high current discharge from a cold LaB6 cathode for neutral beam injection
[IPPJ-453] N80-26159
Particle simulation studies on behavior of laser-produced high-beta plasma in a magnetic field
[IPPJ-452] N80-26160
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Aeronautical engineering: A continuing bibliography, supplement 122
[NASA-SP-7037(122)] N80-25274
NASA geodynamics program
[NASA-TM-81978] N80-25966
Aerospace medicine and biology. A continuing bibliography, supplement 207
[NASA-SP-7011(207)] N80-26032
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Equations for determining aircraft motions for accident data
[NASA-TM-78809] N80-25306
Large-scale wind-tunnel tests of inverting flaps on a STOL utility aircraft model
[NASA-TP-1696] N80-25318
Proceedings of the Aero-Optics Symposium on Electromagnetic Wave Propagation from Aircraft
[NASA-CP-2121] N80-25588
Turbulent two-dimensional jet flow and its effect on laser beam degradation N80-25589
Overview of 6- X 6-foot wind tunnel aero-optics tests N80-25590
Unsteady density and velocity measurements in the 6 foot x 6 foot wind tunnel N80-25594
Optimized laser turrets for minimum phase distortion N80-25600
Summary of all cycle II.5 shear and boundary layer measurements, aerodynamics N80-25604
Head-up transition behavior of pilots during simulated low-visibility approaches
[NASA-TP-1618] N80-26039
Flight-deck automation: Promises and problems
[NASA-TM-81206] N80-26040
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Operational Applications of Satellite Snowcover Observations
[E80-10167] N80-25742
Discharge forecasts in mountain basins based on satellite snow cover mapping N80-25755
A review of LANDSAT-D and other advanced systems relative to improving the utility of space data in water-resources management N80-25759
The albedo of snow for partially cloudy skies
[NASA-TM-80649] N80-25761

An alternate algorithm for correction of the scanning multichannel microwave radiometer polarization radiances using Nimbus-7 observed data
[NASA-TM-80672] N80-25762
Overseas trip report, CV 990 underflight mission
[NASA-TM-80662] N80-25763
Unfulfilled technology needs in space power systems
[NASA-TM-80677] N80-25789
Initial geomagnetic field model from MAGSAT
[NASA-TM-80679] N80-25967
Rain rate range profiling from a spaceborne radar
[NASA-TM-80656] N80-25969
Low power NASA 36 bit time code generator
[NASA-TM-80697] N80-26045
The RSZ BASIC programming language manual
[NASA-TM-80690] N80-26053
The discovery of optical emission from the SNR G 126.2 + 1.6
[NASA-TM-80708] N80-26228
Synchrotron cooling and annihilation of an E(+)-E(-) plasma: The radiation mechanism for the March 5, 1979 transient
[NASA-TM-80674] N80-26229
The Goddard program of gamma ray transient astronomy
[NASA-TM-80675] N80-26230
Observations of electron gyroharmonic waves and the structure of the Io torus
[NASA-TM-80696] N80-26231
The 1979 X-ray outburst of Cen X-4
[NASA-TM-80694] N80-26235
The evolution of supernova remnants in different galactic environments, and its effects on supernova statistics
[NASA-TM-80707] N80-26236
Is the remnant of SN1006 crab-like?
[NASA-TM-80689] N80-26251
High resolution spectroscopy of two gamma-ray bursts in November 1978
[NASA-TM-80575] N80-26252

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.

High-speed T-38A landing gear extension loads
[NASA-TM-58226] N80-25319
The solar power satellite concepts: The past decade and the next decade
[NASA-TM-81000] N80-25360
EPS analysis of nominal STS-1 flight
[NASA-TM-81001] N80-25368
MCC level C formulation requirements. Entry guidance and entry autopilot, optional TAEM targeting
[NASA-TM-81072] N80-25369
MCC level C formulation requirements. Shuttle TAEM targeting
[NASA-TM-80796] N80-25370
STS-1 operational flight profile. Volume 5: Descent, cycle 3
[NASA-TM-81077] N80-25371
Orbiter/shuttle carrier aircraft separation: Wind tunnel, simulation, and flight test overview and results
[NASA-TM-58223] N80-25372
NASA-JSC ozone observations for validation of Nimbus 7-LIMS data
[NASA-TM-58227] N80-25965
A diffusion climatology for Cape Canaveral, Florida
[NASA-TM-58224] N80-25994
Application of functional analysis to perturbation theory of differential equations
[NASA-TM-81073] N80-26087

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.

Development and validation of a combined rotor fuselage induced flow field computational method
[NASA-TP-1656] N80-25296
Flight service evaluation of an advanced composite empennage component on commercial transport aircraft
[NASA-CR-159286] N80-25320
Experimental and analytical transonic flutter characteristics of a geared-elevator configuration
[NASA-TP-1666] N80-25321
Measurement of the handling characteristics of two light airplanes
[NASA-TP-1636] N80-25345
Pollutant emissions from flat-flame burners at high pressures
[NASA-TP-1673] N80-25392
Theoretical study of nonadiabatic boundary-layer stabilization times in a cryogenic wind tunnel for typical stainless steel wing and fuselage models
[NASA-TM-80212] N80-25614
Effects of various assumptions on the calculated liquid fraction in isentropic saturated equilibrium expansions
[NASA-TP-1682] N80-25615
Heating and cooling system
[NASA-CASE-LAR-12393-1] N80-25693
Review of Spectroscopic Data for Measurements of Stratospheric Species
[NASA-CP-2136] N80-26125
Cost estimating relationships for airframes in the development and production phases
[NASA-TM-80229] N80-26198

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Design and cold-air test of single-stage uncooled turbine with high work output
[NASA-TP-1680] N80-25337
Cold-air investigation of a 4 1/2 stage turbine with stage-loading factor of 4.66 and high specific work output. 2: Stage group performance
[NASA-TP-1688] N80-25338
Static and transient performance of YF-102 engine with up to 14 percent core airbleed for the quiet short-haul research aircraft
[NASA-TP-1692] N80-25339
Evaluation of hot corrosion behavior of thermal barrier coatings
[NASA-TM-81520] N80-25412
Analytical and experimental evaluations of the effect of broad property fuels on combustors for commercial aircraft gas turbine engines
[NASA-TM-81496] N80-25454
Computerized video densitometry method for rapid analysis of infrared photographic images
[NASA-TP-1686] N80-25835
Thermal energy storage
[NASA-TM-81514] N80-25779
Pulse charging of lead-acid traction cells
[NASA-TM-81513] N80-25780
Measured and predicted impingement noise for a model-scale under the wing external blown flap configuration with a QCSEE type nozzle
[NASA-TM-81494] N80-26115
The planar multijunction cell: A new solar cell for Earth and space
[NASA-TM-81526] N80-26182

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

F-104 low-gravity calibration tests for materials processing in space precursory experiments
[NASA-TM-78278] N80-25355
Evaluation of the stress corrosion cracking resistance of several high strength low alloy steels
[NASA-TM-78276] N80-25413
An experimental investigation of convection in a fluid that exhibits phase change
[NASA-TM-78277] N80-25613
User's guide for Skylab dynamics program, SKYDYN
[NASA-TM-78279] N80-26056

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.

Stark effect spectrophone for continuous absorption spectra monitoring
[NASA-CASE-NPO-15102-1] N80-25538
Hermetic seal for a shaft
[NASA-CASE-NPO-15115-1] N80-25660

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. WALLOPS FLIGHT CENTER, WALLOPS ISLAND, VA.

GEOS-3 radar altimeter study for the South Atlantic Bight
[NASA-TM-73286] N80-26023
Technical publications of the NASA-Wallops Flight Center, 1973 - 1979
[NASA-TM-73285] N80-26193

NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).

Navaids calibration evaluation with a computer-controlled avionics-data acquisition system
N80-25287

NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER, ATLANTIC CITY, N. J.

Evaluation of existing flammability test methods by comparison of the flammability characteristics of interior materials
[AD-A083137] N80-25393
Flight evaluation of a radar cursor technique
[AD-A083027] N80-25519

NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.

NBS time and frequency dissemination services
[PB80-147747] N80-25494

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.

Journal of research of the National Bureau of Standards, volume 85, no. 1
[PB80-146566] N80-25377
Analysis of tentative seismic design provisions for buildings
[PB80-129182] N80-25496
Update: Local area networks
[PB80-152903] N80-25533
Semiconductor measurement technology: Accurate linewidth measurements on integrated-circuit photomasks
[PB80-148216] N80-25584
Energy test method development for electric heat pump water heaters
[PB80-145212] N80-25911
Polarized LEED study of surface magnetism
[CONF-790909-15] N80-26187

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.

Case studies of convective storms. Case study 4: First echoe case, 27 July 1976
[PB80-143233] N80-26007
Case studies on convective storms. Case study 5: First echo case, 12 July 1979
[PB80-143241] N80-26008
Internal storm motions from a single non-Doppler weather radar
[PB80-143068] N80-26016
Liquid water measurements in high elevation continental cumuli
[PB80-143928] N80-26017
Isentropic trajectories for derivation of objectively analyzed meteorological parameters
[PB80-143118] N80-26018

NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D. C.

The NOAA/NESS program for operational snowcover mapping: Preparing for the 1980's
N80-25744
New goals for snow monitoring by satellite
N80-25745
Snow extent measurements from geostationary satellites using an interactive computer system
N80-25757
An all-digital approach to snow mapping using geostationary satellite data N80-25758
Data extraction and calibration of TIROS-N/NOAA radiometers
[PB80-150824] N80-25772
Environmental satellite imagery
[PB80-153356] N80-26015

NATIONAL GEODETIC SURVEY, ROCKVILLE, MD.

Use of auxiliary ellipsoids in height-controlled spatial adjustments
[PB80-155104] N80-25776

NATIONAL GEOPHYSICAL AND SOLAR-TERRESTRIAL DATA CENTER, BOULDER, COLO.

Solar-geophysical data number 423, part 1. Prompt Reports: Data for October 1979, September 1979
[PB80-146160-SGD-423-PT-1] N80-26244
Solar-geophysical data numer 423, part 2. Comprehensive Reports. Data for May 1979, March 1979 and miscellanea
[PB80-146178] N80-26245

NATIONAL MATERIALS ADVISORY BOARD, WASHINGTON, D. C.

Materials for helicopter gears
[NASA-CR-163068] N80-25323

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SEATTLE, WASH.

A regional surface wind model for mountainous coastal areas
[PB80-146152] N80-26014

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C.
Mariners weather log, volume 23, no. 6
[PB80-145113] N80-26011
NATIONAL PHYSICAL LAB., TEDDINGTON (ENGLAND).
Design and construction of the Boyd-England high pressure apparatus
[NPL-CHEM-110] N80-25634
NATIONAL SCIENCE FOUNDATION, WASHINGTON, D. C.
Coastal upwelling ecosystems analysis. Physical dynamics of the coastal upwelling frontal zone off Oregon
[PB80-139943] N80-26024
NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA.
Aircraft wake vortices. Citations from the NTIS data base
[PB80-809886] N80-25303
Aircraft sonic boom: Effects on buildings. Citations from the NTIS data base
[PB80-806334] N80-25304
Parachutes and decelerators, volume 2. Citations from the NTIS data base
[PB80-806946] N80-25305
Gas and steam turbines, general: Corrosion and erosion, Volume 2. Citations from the NTIS data base
[PB80-806864] N80-25342
Gas and steam turbines, general: Corrosion and erosion. Citations from the engineering index data base
[PB80-806872] N80-25343
Tungsten and tungsten alloy powder metallurgy. Citations from the NTIS data base
[PB80-806011] N80-25434
Tungsten and tungsten alloy powder metallurgy. Citations from the Engineering Index data base
[PB80-806029] N80-25435
Superalloys, Volume 2. Citations from the NTIS data base
[PB80-805831] N80-25436
superalloys, volume 3. Citations from the Engineering Index data base
[PB80-805849] N80-25437
Superalloys, volume 4. Citations from the Engineering Index data base
[PB80-805856] N80-25438
Hydrogen embrittlement of metals. Citations from the American Petroleum Institute data base
[PB80-805963] N80-25439
Hydrogen embrittlement of metals, volume 2. Citations from the NTIS data base
[PB80-805948] N80-25440
Hydrogen embrittlement of metals, volume 3. Citations from the Engineering Index data base
[PB80-805955] N80-25441
Corrosion of stainless steel, volume 2. Citations from the NTIS data base
[PB80-805906] N80-25442
Reinforced plastics: Fiberglass reinforcement, volume 2. Citations from the NTIS data base
[PB80-804743] N80-25451
Reinforced plastics: Boron, carbon, and other reinforcing materials, volume 3. Citations from the NTIS data base
[PB80-804750] N80-25452
Synthetic fuels: Methane, volume 1. Citations from the Engineering Index data base
[PB80-805245] N80-25478
Synthetic fuels: Methane, volume 2. Citations from the Engineering Index data base
[PB80-805252] N80-25479
Metrication in the United States. Citations from the NTIS data base
[PB80-806938] N80-25497
Satellite television. Citations from the NTIS data base
[PB80-806318] N80-25531
Satellite television transmission. Citations from the Engineering Index data base
[PB80-806318] N80-25532
Electron beam semiconductor devices. Citations from the NTIS data base
[PB80-805997] N80-25555
Electron beam semiconductor devices. Citations from the Engineering Index data base
[PB80-806003] N80-25556
Schottky Barrier devices. Citations from the NTIS data base
[PB80-804776] N80-25557
Schottky barrier devices, volume 4. Citations from the Engineering Index data base
[PB80-804784] N80-25558
Schottky barrier devices, volume 5. Citations from the Engineering Index data base
[PB80-804792] N80-25559
Switching circuits, volume 2. Citations from the NTIS data base
[PB80-805880] N80-25580
Switching circuits. Citations from the Engineering Index data base
[PB80-805898] N80-25581
Hybrid microelectronic circuits, volume 2. Citations from the NTIS data base
[PB80-805822] N80-25582
Hybrid microelectronic circuits, volume 3. Citations from the Engineering Index data base
[PB80-805830] N80-25583
Transistor amplifiers, volume 2. Citations from the NTIS data base
[PB80-806037] N80-25586
Fluid control devices, volume 2. Citations from the NTIS data base
[PB80-805260] N80-25632
Fluid control devices. Citations from the Engineering Index data base
[PB80-805278] N80-25633
Electron beam welding, volume 2. Citations from the NTIS data base
[PB80-805971] N80-25674
Electron beam welding, volume 2. Citations from the Engineering Index data base
[PB80-805989] N80-25675
Diesel exhaust emissions, volume 2. Citations from the NTIS data base
[PB80-805385] N80-25676
Diesel exhaust emission control for motor vehicles, volume 1. Citations from the Engineering Index data base
[PB80-805393] N80-25677
Diesel exhaust emission control for motor vehicles, volume 2. Citations from the Engineering Index data base
[PB80-805401] N80-25678
Diesel exhaust emissions. Citations from the American Petroleum Institute data base
[PB80-805419] N80-25679
Gas bearings. Citations from the Engineering Index data base
[PB80-802507] N80-25680
Instrumentation and data processing used in Earth Resources Technology Satellites (ERTS), volume 2. Citations from the NTIS data base
[PB80-805740] N80-25771
Hurricanes forecasting, modification, and research. Citations from the NTIS data base
[PB80-804255] N80-26020
Time series forecasting and prediction. Citations from the NTIS data base
[PB80-804396] N80-26107
Gallium arsenide epitaxial growth, volume 2. Citations from the NTIS data base
[PB80-805583] N80-26189
Gallium arsenide epitaxial growth, volume 3. Citations from the Engineering Index data base
[PB80-805591] N80-26190
Relativity theory. Citations from the NTIS data base
[PB80-805542] N80-26192
Solar eclipses. Citations from the NTIS data base
[PB80-805732] N80-26246
NAVAL ELECTRONIC SYSTEMS COMMAND, WASHINGTON, D. C.
High frequency analog LSI development
[AD-A082664] N80-25543
NAVAL ORDNANCE STATION, LOUISVILLE, KY.
Explosively joining dissimilar metal tubes
[AD-A082068] N80-25683
NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Optical phase distortion due to compressible flow over laser turrets N80-25598
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
DIGIT: The curve digitizing subsystem of the interactive data display system
[AD-A082465] N80-25071
NAVAL SURFACE WEAPONS CENTER, DAHLGREN, VA.
Data generator for a satellite-borne three-axis accelerometer
[AD-A082827] N80-25838
NEUS, INC., SANTA MONICA, CALIF.
Biosources digest, a journal on biomass utilization, volume 1, no. 1
[PB80-140973] N80-25908
Biosources digest: A journal on biomass utilization, volume 1, no. 4
[PB80-140981] N80-25909
NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.
Displacement of oil by carbon dioxide
[DOE/MC-03260/4] N80-25768
NEW MEXICO UNIV., ALBUQUERQUE.
Space Colonies. Citations from the International Aerospace Abstracts data base
[NASA-CR-163204] N80-25353
Digital signal processing with an adaptive delay element N80-25537
Fatigue testing machines. Citations from the International Aerospace Abstracts data base
[NASA-CR-162943] N80-25719
Remote sensing applied to petroleum and mineral exploration. Citations from the International Aerospace Abstracts data base
[NASA-CR-163311] N80-25770
NEW ZEALAND ENERGY RESEARCH AND DEVELOPMENT COMMITTEE, AUCKLAND.
Potential of energy farming for transport fuels in New Zealand
[NZERDC-46] N80-25456
Potential of energy farming for transport fuels in New Zealand, appendices
[NZERDC-46-APP] N80-25457
NORTH CAROLINA STATE UNIV. AT RALEIGH.
Pattern classification using charge transfer devices
[NASA-CR-163237] N80-25780
NORTH CAROLINA STATE UNIV., RALEIGH.
Novel concentrator photovoltaic converter system development
[SAND-80-7004] N80-25912
NORTH CAROLINA UNIV., RALEIGH.
Novel concentrator photovoltaic converter system development
[SAND-80-7004] N80-25912
NORTHROP SERVICES, INC., HUNTSVILLE, ALA.
Solar radiation data forecast and interpolation analysis. Folder 1, part 1: Executive summary. Part 2: Technical analysis (tasks 1 and 2). Part 3: Appendices (tasks 1 and 2)
[COO-4494-1] N80-25982
NORTHWESTERN UNIV., EVANSTON, ILL.
Hydrogen charging effect on creep of pure iron
[COO-1367-107] N80-25425
NUCLEAR REGULATORY COMMISSION, WASHINGTON, D. C.
Mathematical model for simulation of the fate of copper in a marine environment
[NUREG-CR-1098] N80-25432

O

OAK RIDGE ASSOCIATED UNIVERSITIES, INC., WASHINGTON, D.C.
Italy: Estimates of future energy/GDP relationships
[ORAU/IEA(M)-79-20] N80-25804
OAK RIDGE NATIONAL LAB., TENN.
Design of viewing windows for controlled-atmosphere chambers
[ORNL/TM-6804] N80-25350
Criteria for controlled atmosphere chambers
[ORNL/TM-6865] N80-25351
Solidification behavior of austenitic stainless steel filler metals
[ORNL/TM-7116] N80-25424
Radiation effects on organic insulators for superconducting magnets
[ORNL/TM-7077] N80-25551
Performance evaluation of a selected three-ton air-to-air heat pump in the heating mode
[ORNL/CON-34] N80-25630
Directions in automotive engine research and development
[CONF-800212-2] N80-25671

Fatigue of weldments in nuclear pressure vessels and piping
[NUREG-CR-1351] N80-25706
Comparative method for the evaluation of array reflector materials
[ORNL/CSD-42] N80-25877
Consequences of increased coal utilization
[CONF-791108-16] N80-25923
Nuclear waste management: A perspective
[CONF-800117-1] N80-26135

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
La Recherche Aerospatiale, Bimonthly Bulletin no. 1979-5
[ESA-TT-613] N80-25485
Notes on various noise sources N80-25486
Resolution of Navier-Stokes equations by a space-time pseudo-spectral method N80-25487
Unsteady aerothermodynamics modeling N80-25488
Transonic small perturbation equation applied to the solution of two-dimensional unsteady flows N80-25489
Cyclic plastic deformation follower N80-25490
Harmonic excitation of mechanical systems at high frequencies and large accelerators N80-25491
La Recherche Aerospatiale, Bimonthly Bulletin Number 1979-6
[ESA-TT-632] N80-26255
BIRAMIS: Direct measurement of the Earth radiation budget by means of an accelerometer in space N80-26256
An open cycle turbine solar thermal power system N80-26257
Research of an optimal configuration for high stability quartz oscillators on board aircraft and missiles N80-26258
Variational formulation of the plate equilibrium problem. Application to isoparametric finite elements of plates, part 1 N80-26259
Numerical bracketing of the Eigenvalues of complex linear structures N80-26260
Identification of the elastic characteristics of composite materials by means of vibration tests and a model of discrete conservative calculation N80-26261

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, TOULOUSE (FRANCE).
Research on parallel estimators
[CERT-1/7125-DERA] N80-26052

OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).
European Scientific notes, volume 34, no. 1
[AD-A081929] N80-26263

OFFICE OF TECHNOLOGY ASSESSMENT, WASHINGTON, D. C.
Impact of advanced group rapid transit technology
[PB80-153323] N80-26219

OKLAHOMA STATE UNIV., STILLWATER.
Handling qualities of large flexible control-configured aircraft
[NASA-CR-163206] N80-25344
Consequences of the mass spectrometric and infrared analysis of oils and asphaltenes for the chemistry of coal liquefaction. Characterization of coal-derived liquids and other fossil fuel related materials employing mass spectrometry
[FE-2537-10] N80-25460
Incompressible fluid flow in collapsible tubes N80-25575
Development of lightweight mine roof supports
[PB80-143936] N80-25774
Design parameters for solar powered absorption cooling systems with chilled water storage N80-25778
Unified higher order path and envelope curvature theories in kinematics N80-26110

OLD DOMINION UNIV. RESEARCH FOUNDATION, NORFOLK, VA.
Sensor for measuring instantaneous angle of attack of helicopter blades
[NASA-CR-3297] N80-25330
An investigation of the feasibility of improving oculometer data analysis through application of advanced statistical techniques
[NASA-CR-163238] N80-26055
Laminar and turbulent flow solutions with radiation and ablation injection for Jovian entry
[NASA-CR-163215] N80-26238

OPERATIONS RESEARCH, INC., SILVER SPRING, MD.
A propagation effects handbook for satellite systems design. A summary of propagation impairments on 10-100 GHz satellite links, with techniques for system design
[NASA-CR-163207] N80-25520
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 1: Risk assessment method and results
[PB80-138472] N80-26217
Risk assessment of air versus other transportation modes for explosives and flammable cryogenic liquids. Volume 2: Supporting Documentation
[PB80-138480] N80-26218

OREGON STATE UNIV., CORVALLIS.
Variations in phytoplankton physiological parameters during transient nitrogen environments N80-26027

OREGON UNIV., EUGENE.
Correlation holography: Imaging of atoms when sigma sub (inelastic) sigma sub (elastic)
[DOE/ER-70004/258] N80-25644

OREGON UNIV., PORTLAND.
Some aspects of the Quark-Parton model in the weak and the strong interaction phenomenology N80-26117

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Consequences of increased coal utilization
[CONF-791108-16] N80-25923

PARSONS (RALPH M.) CO., LOS ANGELES, CALIF.
STARFIRE: A commerical Tokamak reactor
[ANL/FPP/TM-125] N80-26171

PEDCO-ENVIRONMENTAL, INC., CINCINNATI, OHIO.
Guidance for lowest achievable emission rates from 18 major stationary sources of particulate, nitrogen oxides, sulfur dioxide, or volatile organic compounds
[PB80-140262] N80-25948

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Vibration of cylindrical shells, with and without ring stiffening
[AD-A082524] N80-25701
Application of HCMM satellite data to the study of urban heating patterns
[E80-10165] N80-25740
Digital wavefront reconstruction for acoustical applications N80-26112
Oscillator strengths for highly ionized atomic systems
[COO-4264-13] N80-26130

PENNSYLVANIA UNIV., PHILADELPHIA.
Analysis and evaluation in the production process and equipment area of the low-cost solar array project
[NASA-CR-163208] N80-25782
Two dimensional analysis of the photoionization chamber N80-26147

PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
Study of blade aspect ratio on a compressor front stage
[NASA-CR-159556] N80-25333

PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD, CONN.
Engine component improvement: Performance improvement, JT9D-7 3.8 AR fan
[NASA-CR-159806] N80-25332
Performance deterioration based on in-service engine data: JT9D jet engine diagnostics program
[NASA-CR-159525] N80-25340

PRINCETON UNIV., N. J.
Nitramine monopropellant deflagration and general nonsteady reacting rocket chamber flows N80-25373
Research on data analysis in the physical sciences
[COO-2310-6] N80-26111

R

RADIAN CORP., AUSTIN, TEX.
Solar heating and cooling demonstration project at Radian Corporation, Austin, Texas
[NASA-CR-161442] N80-25784

RADIO TECHNICAL COMMISSION FOR AERONAUTICS, WASHINGTON, D. C.
Minimum performance standards: Airborne Omega receiving equipment
[RTCA/DO-164A] N80-25310
Environmental conditions and test procedures for airborne equipment
[RTCA-309-79/SC135-41] N80-25329
VHF air-ground communication technology and spectrum utilization
[RTCA/DO-169] N80-25510
Minimum performance standards: Emergency locator transmitters: Automatic Fixed-ELT (AF), Automatic Portable-ELT (AP), Automatic Deployable-ELT (AD) operating on 121.5 and 243.0 megahertz
[RTCA/DO-168] N80-25511
VHF air-ground technology and spectrum utilization
[RTCA-155-79/SC140-17-REV] N80-25513
Audio systems characteristics and minimum performance standards. Aircraft microphones (except carbon), aircraft headsets and speakers and aircraft audio selector panels and amplifiers
[RTCA-305-79/SC132-54-REV-2] N80-25514
Recommendations on policies and procedures for off-the-shelf electronic test equipment acquisition and support
[RTCA-307-79/SC134-69] N80-25535

RAMAN AERONAUTICS RESEARCH AND ENGINEERING, INC., PALO ALTO, CALIF.
Pressure and temperature fields associated with aero-optics tests N80-25591

RAND CORP., SANTA MONICA, CALIF.
Cost-effectiveness measures of replenishment strategies for systems of orbital spacecraft
[AD-A081859] N80-25356

RAYTHEON CO., WALTHAM, MASS.
Diamond technology study
[AD-A081928] N80-25545

RCA ADVANCED TECHNOLOGY LABS., CAMDEN, N. J.
Advanced image compression study
[AD-A082014] N80-25637

RCA LABS., PRINCETON, N. J.
Semiconductor measurement technology: Comprehensive test pattern and approach for characterizing SOS technology
[PB80-147952] N80-25585

RCA SOLID STATE DIV., SOMERVILLE, N.J.
High reliability, low cost integrated circuits, phase 2 development report
[AD-A081666] N80-25539

RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Thermophysical properties of inorganic polysulfides
[COO-10387-01] N80-25401
The rate (time)-dependent behavior of Ti-7Al-2Cb-1Ta titanium alloy at room temperature under quasistatic monotonic and cyclic loading
[AD-A082623] N80-25416
Parallel processing algorithms for the identification, estimation and control of nonlinear dynamical systems N80-25534

RESEARCH CORP. OF NEW ENGLAND, WETHERSFIELD, CONN.
Assessment of methods for control of fugitive emissions from paved roads
[PB80-139330] N80-25495

RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N. C.
Novel concentrator photovoltaic converter system development
[SAND-80-7004] N80-25912

RICE UNIV., HOUSTON, TEX.
Augmented Lagrangian methods for constrained optimization: The role of the penalty constant
[DOE/ER-05046/16] N80-26097

ROCHESTER UNIV., N. Y.
Atmospheres for hot, high-gravity, pure helium stars N80-26224

ROCKETDYNE, CANOGA PARK, CALIF.
Forging evaluation of 304L stainless steel
[RFP-2897] N80-25420

ROCKWELL INTERNATIONAL CORP., CANOGA PARK, CALIF.
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 4: Commerical and pilot plant cost data
[SAN-1483-1/5] N80-25803

Hybrid thermal storage with water
[ESG-DOE-13259] N80-25981
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 1: Executive summary
[SAN-1483-1/1] N80-25875
Conceptual design of advanced central receiver power systems sodium-cooled receiver concept. Volume 2, book 1: Commercial plant conceptual design
[SAN-1483-1/2] N80-25876
Technical and management support for the development of small wind systems
[RFP-2974/3533-79-2] N80-25889

ROCKWELL INTERNATIONAL CORP., GOLDEN, COLO.
New developments in wind systems technology
[RFP-3000] N80-25888

ROCKWELL INTERNATIONAL CORP., THOUSAND OAKS, CALIF.
Influence of Alpha/Beta interface phase on fracture toughness and fatigue crack growth rate in Ti-6Al1-4V
[AD-A082456] N80-25417

ROLLS-ROYCE LTD., BRISTOL (ENGLAND).
The Engine Usage Monitoring System (EUMS): An heuristic approach to cost effective flight data monitoring and analysis N80-25280

ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
Single crystal growth of zirconia utilizing a skull melting technique
[AD-A082323] N80-26183

ROSE ENGINEERING AND RESEARCH, INC., INCLINE VILLAGE, NEV.
Airborne measurement of atmospheric turbulence N80-25606

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
The concept of effective stress applied to elasticity and to viscoplasticity in the presence of anisotropic damage
[RAE-LIB-TRANS-2039] N80-25696
Chances of detecting and differentiating central system effects of drugs in animal experiments with special consideration of behavioural pharmacological methods
[RAE-LIB-TRANS-2034] N80-26029

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J.
Droplet drag and breakup in shock-wave induced unsteady flows N80-25585
A microprogrammable digital signal processor: Conception, design, application N80-26043
Lattice dynamics with short-range correlations applied to two-phonon Raman scattering N80-26175

S

SAAB-SCANIA, LINKOPING (SWEDEN).
Some aspects on improvments of a first-order dynamic optimization algorithm
[SAAB-TN-AE-73] N80-25694
Buckling of sandwich panels subjected to axial compression, shear forces and lateral pressures. Part 2: Analysis
[SAAB-TN-AE-72-BT-2] N80-25696

SALFORD UNIV. (ENGLAND).
Plasma aided techniques N80-25501

SANDIA LABS., ALBUQUERQUE, N. MEX.
Simulated hail test facility
[SAND-79-1114] N80-25349
Missile circumferential current density for plane wave electromagnetic field illumination
[AD-A082763] N80-25526
Performance of digital integrated circuit technologies at very high temperature
[SAND-79-2092C] N80-25550
Measurement of weak shock-wave profiles
[SAND-79-6004] N80-25617
Long tube heat exchanger: The facility and some preliminary tests on the down center/up annular flow configuration
[SAND-79-0823] N80-25623
Calculation of skin-friction coefficients for low Reynolds number turbulent boundary layer flows
[NASA-CR-163062] N80-25624
Correlation of roughtip boundary-layer transition data measured in ballistics-range experiments
[SAND-79-0849C] N80-25625
Semiautomated calibration: A case study
[SAND-79-2004C] N80-25643
Laser heating of a molecular gas channel
[SAND-80-0154] N80-25654
Comparison of ignition locations in a high swirl engine
[SAND-79-8715] N80-25670
Drilling horizontal holes in coal bed from the surface with water jets
[SAND-80-0057C] N80-25706
Novel solar cell concentrator photovoltaic converter system
[SAND-79-7048] N80-25843
Use of thin glass reflectors for solar concentrators
[SAND-80-0109C] N80-25857
Solarization of heliostat glasses
[SAND-79-8754] N80-25858
Magma energy: A feasible alternative?
[SAND-80-0308C] N80-25859
Preliminary development of the Band Type Variable Inertia Flywheel (BVIF)
[SAND-79-7089] N80-25879
Aerodynamic interference between two Darrieus wind turbines
[SAND-79-1584C] N80-25897
Comparison between results of the HELIOS and MIRVAL computer codes applied to central receiver solar-energy collection
[SAND-79-8286] N80-26075
User//programmer guide to UCMD 64: Dumping drawing files to tape
[SAND-80-0156] N80-26076
Semiconductor development laboratory computer control software
[SAND-79-1709] N80-26078
Linear equations in general purpose codes for stiff ODEs
[SAND-80-0429] N80-26083
Fracture analysis of optical fibers
[SAND-79-2431C] N80-26145
Cross sections for electron and photon processes required by electron-transport calculations
[SAND-79-0772] N80-26188

SANDIA LABS., LIVERMORE, CALIF.
Laser spark ignition and extinction of a methane-air diffusion flame
[SAND-79-8288] N80-25399
Users manual: Secondary data reduction programs for the Eclipse S-200/230 shock and vibration measurement systems
[SAND-79-8065] N80-25709
Silver deterioration in second surface solar mirrors
[SAND-79-8276] N80-25858
SIXDOF: A computer program for trajectory simulation of ballistic flight vehicles
[SAND-79-8260] N80-26077
Investigation of routines for inverting block tridiagonal matrices
[SAND-80-8206] N80-26094

SCIENCE APPLICATIONS, INC., MCLEAN, VA.
Solar photovoltaic flat panel applications experiment at the Oklahoma Center for Science and Arts
[DOE/ET-23063/1] N80-25800

SCIENCE APPLICATIONS, INC., PASADENA, CALIF.
Viking orbiter stereo imaging catalog
[NASA-CR-3277] N80-26240

SCIENTIFIC DESIGN CO., INC., NEW YORK.
Evaluation of the Texaco synthesis gas generation process for the production of hydrogen from SRC-2 residue
[ORNL/SUB-7240/6] N80-25464

SERATA GEOMECHANICS, INC., BERKELEY, CALIF.
Geoscience data base handbook for modeling a nuclear waste repository, volume 1
[NUREG-CR-0912-VOL-1] N80-26133

SHAKER RESEARCH CORP., BALLSTON LAKE, N. Y.
Rotor-bearing dynamics technology design guide. Part 4: Cylindrical roller bearings
[AD-A082355] N80-25662

SIERRA HYDROTECH, PLACERVILLE, CALIF.
Application of satellite imagery to hydrologic modeling snowmelt runoff in the southern Sierra Nevada N80-25754

SIMULA, INC., TEMPE, ARIZ.
Aircraft crash survival design guide. Volume 2: Aircraft crash environment and human tolerance
[AD-A082512] N80-25307
Aircraft survival design guide. Volume 5: Aircraft postcrash survival
[AD-A082513] N80-25308

SOIL CONSERVATION SERVICE, DENVER, COLO.
LANDSAT derived snowcover as an input variable for snowmelt runoff forecasting in south central Colorado N80-25751

SOLAR TURBINES INTERNATIONAL, SAN DIEGO, CALIF.
Development of polyimide materials for use in solar energy systems
[DOE/CS-25305/T1] N80-25865

SOLAREX CORP., ROCKVILLE, MD.
Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T2] N80-25853
Photovoltaic mechanisms in polycrystalline thin film solar cells
[DSE-3413-T3] N80-25854

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION, INC., ORLANDO, FLA.
Bayesian reliability theory for repairable equipment
[AD-A083009] N80-25684

SOUTHERN CALIFORNIA GAS CO., LOS ANGELES.
SAGE, Solar Assisted Gas Energy
[PB80-144363] N80-25906
SAGE, Solar Assisted Gas Energy
[PB80-153836] N80-25907

SOUTHERN METHODIST UNIV., DALLAS, TEX.
A study of the reinforcement required for cutouts in aircraft semi-monocoque structure N80-25317
Energy dissipation of Rayleigh waves due to absorption along the path of the use of finite-element method N80-25661

SOUTHERN RESEARCH INST., BIRMINGHAM, ALA.
Particulate sampling and support: Executive summary
[PB80-149883] N80-25958

SPECTRON DEVELOPMENT LABS., INC., COSTA MESA, CALIF.
Aero-optical characterization of aircraft optical turrets by holography, interferometry and shadowgraph N80-25593

SPERRY UNIVAC, ST. PAUL, MINN.
Solar collector studies for solar heating and cooling applications
[ALO-5355-T1] N80-25850

SPIRE CORP., BEDFORD, MASS.
Amorphous silicon solar cells by hydrogen implantation
[SAN-2042-1] N80-25842

SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
ATS-6 measurements during AVEFRIA
[AD-A082192] N80-25525
Line-focus solar central power systems, phase1
[SAN-0115-140-1] N80-25903
Assessment of vertical distributions of photochemical pollutants and meteorological variables in the vicinity of urban areas
[PB80-139918] N80-25933
Atmospheric distributions, sources and sinks of selected halocarbons, hydrocarbons, SF6, and N2O
[PB80-142706] N80-25934
Mammalian toxicological evaluation of TNT wastewaters. Volume 2: Acute and subacute mammalian toxicity of TNT and LAP mixture
[AD-A080957] N80-26034
Important atomic collision processes in the heavy ion inertial fusion program
[SAN-0115-137-1] N80-26129

STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Charmed meson production and decay properties at the psi(3770)
[SLAC-219] N80-26127

STANFORD UNIV., CALIF.
Microwave surface impedance studies on copper at low temperature N80-25407
The inverse scattering problem for perturbed wave equations N80-25515
The use of mechanical alloying in the manufacture of multifilamentary superconductor wire N80-25536
Photoelectronic properties of zinc phosphide crystals, films and heterojunctions
[SU-DSE-4042-T18] N80-25847

Porous media flow problems: Natural convection and non-Newtonian N80-25579
Finite element simulation of simple three-dimensional fully cavitating flows [AD-A082823] N80-25618
An adaptive Bayesian scheme for estimating reliability growth under exponential failure times [AD-A083006] N80-25683
HCMM: Soil moisture in relation to geologic structure and lithology, northern California [E80-10163] N80-25738
Probability modeling and estimation for hourly variation of air pollution concentrations. Study on statistics and environmental factors in health (SIMS) [DOE/EV-22874/66] N80-25924

STATE UNIV. OF NEW YORK AT ALBANY.
The effect of atmospheric particulate matter on the propagation of a laser beam [AD-A083039] N80-25648
Studies in relativistic many-body perturbation theory for atomic systems: Hyperfine properties and forbidden optical transitions N80-26118
Relativistic many body perturbation theory: Application to spin-Hamiltonian parameters of atoms and ions with half-filled shells N80-26119
Background sky brightness measurements for application to space surveillance systems [AD-A081881] N80-26237

STATE UNIV. OF NEW YORK AT BUFFALO.
The measurement of turbulence with the burst-type laser Doppler anemometer: Errors and correction methods N80-25569

STEVENS INST. OF TECH., HOBOKEN, N. J.
Technical manual for engineers and scientists [PB80-143286] N80-25496

STICHTING MATHEMATISCH CENTRUM, AMSTERDAM (NETHERLANDS).
Synchronization of weakly coupled relaxation oscillators [MC-TW-180/78] N80-26098
Some convexity properties of Euler's gamma function [MC-ZW-105/78] N80-26099

STUTTGART UNIV. (WEST GERMANY).
High repetition rate electro-optic Q-switching of Nd(3+):YAG lasers showing strong optical birefringence [IPF-79-6] N80-25658
Applications in structural analysis [ISD-251] N80-25698
Inelastic transient stress analysis for thermal and mechanical loading N80-25699
Structural layout with stress-displacement and fabrication limits N80-25700

SYDNEY UNIV. (AUSTRALIA).
Finite element analysis of problems with infinitely distant boundaries [PB80-149230] N80-26100

SYRACUSE UNIV., N. Y.
Geometry of Orbiting Earth Satellites (GOES) [AD-A082381] N80-25362
Confidence interval robustness of correlation coefficient N80-26101

SYSTEM DEVELOPMENT CORP., HUNTSVILLE, ALA.
REDIMEN: Systems analysis of integrated networks of tasks. Saint redimensioning program [AD-A082735] N80-26072

SYSTEMS APPLICATIONS, INC., SAN RAFAEL, CALIF.
Performance measures and standards for air quality simulation models [PB80-152838] N80-25950

T

TECHNISCHE HOCHSCHULE, AACHEN (WEST GERMANY).
Engine parameter trend analysis by LEADS 200: Possibilities and limitations N80-25277
Investigations on local fault detection at turbojet engines N80-25278

TECHNISCHE UNIVERSITAET, BRUNSWICK (WEST GERMANY).
Localization of faults in jet engines by calculation of component characteristics N80-25279
Reduction of measured data and a method of early detection of sensor breakdown N80-25283

TECHNISCHE UNIVERSITAET, MUNICH (WEST GERMANY).
Relations for a flight performance computer N80-25291
Performance prediction of power augmented electrothermal hydrazine thrusters [TUM-LRT-KB-78/1] N80-25375

TEESSIDE POLYTECHNIC, CLEVELAND (ENGLAND).
Relation between the surface friction of plates and their statistical microgeometry [AD-A082758] N80-25884

TELEDYNE ENERGY SYSTEMS, TIMONIUM, MD.
Selenide isotope Generator for the Galileo mission. Heat pipe attachment technology [TES-33009-45] N80-25832
Selenide isotope generator for the Galileo mission. GIG/Galileo hermetic receptacle test program [TES-33009-47] N80-25833
Selenide isotope generator for the Galileo mission. SIG thermal insulation tests evaluation [TES-33009-50] N80-25834
Selenide isotope generator for the Galileo mission. SIG hermetic bimetal weld transition joint [TES-33009-51] N80-25835

TELESPAZIO, S.P.A., ROME (ITALY).
An automatic classification method for LANDSAT data as resulting from different experiences in the Italian environment [E80-10160] N80-25736

TELEX COMMUNICATIONS, INC., BLUE EARTH, MINN.
Solar heating system installed at Telex Communications, Inc., Blue Earth, Minnesota [NASA-CR-161437] N80-25796

TENNESSEE UNIV., KNOXVILLE.
An electro-optical ion detector for spark source mass spectrometry N80-25389
Analytical and experimental investigation of flow between a smooth stationary disc and a grooved rotating disc N80-25584
The relationship of exercise performance to variations in blood acid-base status induced by changes in the inspired oxygen fraction N80-26030
Charge exchange measurements of ion behavior in the ISX Tokamak N80-26149
Determination of primordial and cosmogenic radioactivity in achondritic meteorites by low-level, gamma-ray spectrometry [DOE/TIC-11096] N80-26241

TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA.
Evaluation of physical/chemical coal cleaning and flue gas desulfurization [PB80-147622] N80-25481

TEXAS A&M UNIV., COLLEGE STATION.
A study of reactions in a time-of-flight mass spectrometer N80-25387
Catalytic conversion of methanol to low molecular weight hydrocarbons [COO-4717-T1] N80-25470
Loop yagi array antennas N80-25517
Finite element analysis of laminar convective heat transfer N80-25574
Models of atmospheric water vapor budget for the Texas HIPLEX area [PB80-147986] N80-26013
Spectroscopic studies of molecular structure and intramolecular dynamics N80-26121
In-depth analysis of conformational changes in small ring molecules N80-26122

TEXAS DEPT. OF WATER RESOURCES, AUSTIN.
Texas HIPLEX interim progress report [PB80-133101] N80-26009
Texas HIPLEX, 1979: Field operations summary [PB80-134471] N80-26010
Models of atmospheric water vapor budget for the Texas HIPLEX area [PB80-147986] N80-26013

TEXAS TECHNOLOGICAL UNIV., LUBBOCK.
Vortex model of the Darrieus turbine: An analytical and experimental study [SAND-79-7058] N80-25867

TEXAS UNIV., AUSTIN.
Determination of friction factors and heat transfer coefficients for flow past artificially roughened surfaces [DOE/TIC-10283] N80-25829

TEXAS UNIV. AT ARLINGTON.
Properties of differential equations through different measures [AD-A082633] N80-26091

TEXAS UNIV. AT AUSTIN.
The influence of ballistic damage on the aeroelastic characteristics of lifting surfaces [AD-A082536] N80-25322
Electrothermal atomization in atomic absorption spectrometry: Fundamental causes of interference effects and a study of an exploding thin film atomizer N80-25385
Approximation and numerical analysis of nonlinear equations of evolution [AD-A082452] N80-26092

TORONTO UNIV. (ONTARIO).
Analysis of community solar systems for combined space and domestic hot water heating using annual cycle thermal energy storage [SERI/TP-355-570] N80-25900

TRANSPORTATION RESEARCH BOARD, WASHINGTON, D.C.
Application of computer and interactive graphics [PB80-147051] N80-26079

TRIBON BEARING CO., CLEVELAND, OHIO.
Evaluation of new materials for rotor hub journal bearings [AD-A082444] N80-25885

TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
High frequency analog LSI development [AD-A082664] N80-25843
Surface acoustic wave microwave oscillator and frequency synthesizer [AD-A082351] N80-25844
Potential applications of biomass technology at National Technology Laboratories and Mississippi Army Ammunition Plant [AD-A082756] N80-25797
The use of pH and chloride electrodes for the automatic control of flue gas desulfurization systems [PB80-136464] N80-25947
Development of an automatic H2SO4 monitor [PB80-128191] N80-25957
Microwave scaling of laser plasma interactions [DOE/DP-40067/T1] N80-26168

U

UNION CARBIDE CORP., BOUND BROOK, N.J.
Solid sorbent for collecting atmospheric sulfur dioxide [PB80-131949] N80-25948

UNION CARBIDE CORP., OAK RIDGE, TENN.
Calculation of fluid circulation patterns in the vicinity of submerged jets using ORSMAC [K/CSD-4] N80-25828

UNITED TECHNOLOGIES CORP., EAST HARTFORD, CONN.
External fuel vaporization study, phase 1 [NASA-CR-159850] N80-25453

UNITED TECHNOLOGIES CORP., SOUTH WINDSOR, CONN.
Cogeneration technology alternatives study. Volume 1: Summary report [NASA-CR-159759] N80-25792
Cogeneration technology alternatives study. Volume 2: Industrial process characteristics [NASA-CR-159760] N80-25793
Cogeneration technology alternatives study. Volume 4: Heat Sources, balance of plant and auxiliary systems [NASA-CR-159762] N80-25794
Cogeneration technology alternatives study. Volume 6: Computer data [NASA-CR-159764] N80-25795

V

VALUE ENGINEERING CO., ALEXANDRIA, VA.
OTEC support services [COO-4831-T11] N80-25799

VARIAN ASSOCIATES, PALO ALTO, CALIF.
Novel solar cell concentrator photovoltaic converter system [SAND-79-7048] N80-25843

VIRGINIA HIGHWAY AND TRANSPORTATION RESEARCH COUNCIL, CHARLOTTESVILLE.
An empirical relationship between mesoscale carbon monoxide concentrations and vehicular emission rates
[PB80-138308] N80-25932
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Short beam shear tests of polymeric laminates and unidirectional composites
[NASA-CR-163239] N80-25381
Near-wall similarity in two- and three-dimensional turbulent boundary layers N80-25578
Heat conduction in partial vacuum
[ALO-5367-1] N80-25618
Inequalities for joint distribution of quadratic forms
[AD-A083033] N80-26090
VIRGINIA UNIV., CHARLOTTESVILLE.
Chemical ionization mass spectrometry
[AD-A081249] N80-25394
Chemical ionization mass spectrometry of nitroaromatic vapors
[AD-A081228] N80-25395
VOUGHT CORP., DALLAS, TEX.
Design and development of a hard tube flexible radiator system
[NASA-CR-160683] N80-25380

W

WASHINGTON STATE UNIV., PULLMAN.
Synoptic meteorology and air quality patterns in the St. Louis RAPS program
[PB80-148290] N80-26012
WASHINGTON UNIV., SEATTLE.
Numerical modeling with a moving coordinate system: Application to flow through porous media N80-25580
A photographic study of drop formation heat and mass transfer N80-25581
Fluid processes in supersonic diffusion lasers N80-25646
Baroclinic wave vacillations N80-25960
An energy-balance climate model with separate land and oceanic effects N80-25962
The combination of aerial and terrestrial photogrammetry in structural monitoring N80-25963
A model for modification of the cloud-topped marine boundary layer during cold air outbreak N80-25966
Phytoplankton primary production below Arctic Ocean pack ice: An ecosystems analysis N80-26029
The complexity of parallel algorithms N80-26048
Sequential control structure abstractions for programming languages N80-26049
Vibrational energy transfer by molecular collisions at high temperatures utilizing the diffusion cloud technique N80-26123
Stimulated Raman scattering from an underdense hydrogen plasma N80-26150
Shock-induced grain alignment in the Orion Nebula N80-26222
An analysis of the atmosphere of the RV Tauri star AC Herculis N80-26226
Periodic mass transfer in the X-ray binary system Her X-1/HZ Her N80-26227
WASHINGTON UNIV., ST. LOUIS, MO.
Electron-photon interactions in piezoelectric semiconductors for the phase insensitive detection of ultrasound N80-26113
Abundances and energy spectra of individual elements in the heavy cosmic rays N80-26248
WAYNE STATE UNIV., DETROIT, MICH.
Modelling and resource allocation of linearly restricted operating systems
[AD-A082383] N80-26046
Collisional studies of ionization processes with heavy particle and photon
[AD-A082640] N80-26126
WEAPONS SYSTEMS RESEARCH LAB., ADELAIDE (AUSTRALIA).
Use of a new analytical technique to determine heat input from inner surface temperatures measured on a hemispherical shell during a free flight experiment
[WSRL-0069-TR] N80-25587
WEIZMANN INST. OF SCIENCE, REHOVOTH (ISRAEL).
Synthesized structured programming
[AD-A082359] N80-26074
WENTWORTH INST., BOSTON, MASS.
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083019] N80-25877
Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere
[AD-A083022] N80-25878
WEST VIRGINIA UNIV., MORGANTOWN.
Optimization studies of various coal-conversions systems: Coal dissolution phenomena
[FE-2274-7] N80-25481
Dynamic responses of a multi-layered rectangular plate on viscoelastic foundation due to moving loads N80-25686
Theoretical and physical approach to light gage steel shear diaphragms N80-25691
WESTERN UNION TELEGRAPH CO., UPPER SADDLE RIVER, N.J.
The 30/20 GHZ net market assessment
[NASA-CR-159837] N80-26109
WESTINGHOUSE ELECTRIC CORP., EAST PITTSBURGH, PA.
Design study and economic assessment of multi-unit offshore wind energy conversion systems applications. Volume 4: Meteorological and oceanographic surveys
[WASH-2330-78/4-VOL-4] N80-25836
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 3: System analysis
[WASH-2330-78/4-VOL-3] N80-25837
Design study and economic assessment of multi-unit offshore wind energy conversion systems application. Volume 2: Apparatus designs and costs
[WASH-2330-78/4-VOL-2] N80-25838
WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Compact closed cycle Brayton system feasibility study, volume 1
[AD-A081379] N80-25686
Primer on computer graphics programming
[AD-A082732] N80-26073
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[RR-79-9D9-HYTEM-R3] N80-25419
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[FE-3050-T2] N80-25421
WISCONSIN UNIV. - MADISON.
Surface voltammetry and coulometry of solid electrodes N80-25388
Simulation and design of solar thermal processes
[COO-2588-T1] N80-25823
A rapid analysis of surface waters by high pressure liquid chromatography
[PB80-132681] N80-25949
Vortex generation in a nested grid numerical thunderstorm model N80-25986
The climatic impact of sea surface temperature anomalies on zonally symmetric and asymmetric flows: A quasi-geostrophic modeling approach N80-26022
The induction of the syntax of natural language by computer N80-26050
Continuous time series modeling with applications N80-26108
Fabrication and diagnostics of oxide tunneling barriers in niobium based superconductive tunnel junctions N80-26176
WISCONSIN UNIV., MADISON.
Continuously variable transmissions: Theory and practice
[UCRL-15037] N80-25868
On K-line and K x K block iterative schemes for a problem arising in 3-D elliptic difference equations
[AD-A082390] N80-26066
Summary of the fusion-fission hybrid fuel cycle analysis (trilumless hybrids)
[UWFDM-337] N80-26136
WOLF RESEARCH AND DEVELOPMENT CORP., POCOMOKE CITY, MD.
Arc program documentation
[NASA-CR-158867] N80-26054
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
New England shelf/slope experiment. Data report: The moored array
[PB80-151640] N80-26025
The application of inverse methods to problems in ocean circulation
[PB80-149651] N80-26026
WYLE LABS., INC., HUNTSVILLE, ALA.
Test results on the Frenchman's Reef solar data acquisition and control system
[NASA-CR-161449] N80-25783
WYOMING UNIV., LARAMIE.
Remote electromagnetic sensing of underground coal burns
[FE-2414-8] N80-25767

Y

YALE UNIV., NEW HAVEN, CONN.
Study of experiments on condensation of nitrogen by homogeneous nucleation at states modelling those on the national transonic facility
[NASA-CR-163217] N80-25294
Hybrid clustering N80-26105
The dwarf spheroidal galaxy in Draco N80-26221
X-rays from active galactic nuclei: Emission mechanisms and interaction with ambient media N80-26247

Z

ZURICH UNIV. (SWITZERLAND).
Digital mapping of mountain snowcover under European conditions N80-25747

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing

Listings in this index are arranged alpha-numerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

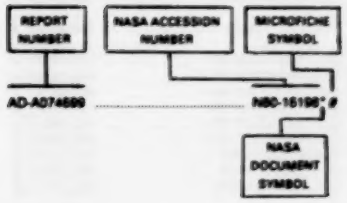
AF PROJ. 0172 ..... N80-25362
AF PROJ. 1703 ..... N80-25977
AF PROJ. 2029 ..... N80-25527
AF PROJ. 2183 ..... N80-26067
AF PROJ. 2238 ..... N80-26070
AF PROJ. 2301 ..... N80-25322
AF PROJ. 2304 ..... N80-25346
N80-25636
N80-25683
AF PROJ. 2306 ..... N80-26141
N80-26183
AF PROJ. 2311 ..... N80-26237
AF PROJ. 2338 ..... N80-25684
AF PROJ. 3048 ..... N80-25662
AF PROJ. 3066 ..... N80-25336
N80-25341
AF PROJ. 4594 ..... N80-26195
AF PROJ. 5550 ..... N80-26074
AF PROJ. 5597 ..... N80-26046
AF PROJ. 6095 ..... N80-25313
AF PROJ. 6244 ..... N80-25637
AF PROJ. 6302 ..... N80-26035
AF PROJ. 6687 ..... N80-25978
AF PROJ. 7184 ..... N80-26072
AF PROJ. 7231 ..... N80-25915
N80-25916
N80-25917
N80-25918
AF PROJ. 7600 ..... N80-25361
AF PROJ. 8470 ..... N80-26082
AF-AFOSR-2968-76 ..... N80-25346
AF-AFOSR-3179-77 ..... N80-25683
AF-AFOSR-3271-77 ..... N80-25636
AF-AFOSR-3483-78 ..... N80-26074
AF-AFOSR-3589-78 ..... N80-25322
ARPA ORDER 2397 ..... N80-25565
AT(07-2)-1 ..... N80-25422
DA PROJ. 1F2-63209-DB-38 ..... N80-25665
DA PROJ. 1F6-65702-D-127 ..... N80-26000
DA PROJ. 1L1-62209-AH-76 ..... N80-25307
N80-25308
N80-25540
DA PROJ. 1L1-62705-AH-94 ..... N80-25541
N80-25542
DA PROJ. 3E1-62720-A-835 ..... N80-26034
DAAB07-78-C-2991 ..... N80-25541
N80-25542
DAAB07-78-C-2992 ..... N80-25544
DAAG29-76-G-0326 ..... N80-25394
DAAG29-77-G-0031 ..... N80-25683
DAAG29-77-G-0062 ..... N80-26091
DAAG29-77-G-0067 ..... N80-26092
DAAG29-77-G-0216 ..... N80-25397
DAAG29-78-G-0125 ..... N80-26126
DAAG29-78-G-0136 ..... N80-26125
DAAG29-78-G-0172 ..... N80-26090
DAAG29-79-G-0031 ..... N80-25648
DAAG53-76-C-0086 ..... N80-25395
DAAJ02-76-C-0060 ..... N80-25665
DAAJ02-77-C-0021 ..... N80-25307
N80-25308
DAAK10-78-C-0268 ..... N80-25787
DAAK70-77-C-0097 ..... N80-25774
DACW39-78-M-2676 ..... N80-26073
DAHC04-74-G-0079 ..... N80-25394
DAMD17-76-C-6050 ..... N80-26034
DARPA ORDER 3285 ..... N80-26145
DCPA01-79-C-0268 ..... N80-25765
DE-AC01-78ET-33009 ..... N80-25832
N80-25833
DE-AC01-79ET-23103 ..... N80-25840
N80-25885
DE-AC02-76CH-00016 ..... N80-26185
DE-AC02-76ER-01188 ..... N80-25427
DE-AC02-76ER-04972 ..... N80-25713
DE-AC02-79CS-30122 ..... N80-25806
DE-AC02-79ER-10397 ..... N80-25401
DE-AC02-79ER-10409 ..... N80-26137
DE-AC02-79ET-15422 ..... N80-26095
DE-AC03-765F-00515 ..... N80-26127
DE-AC03-77ET-11320 ..... N80-25848
DE-AC03-79ET-11321 ..... N80-25891
DE-AC03-79ET-23040 ..... N80-25882
DE-AC03-79ET-23042 ..... N80-25842
DE-AC04-76DP-00053 ..... N80-25450
DE-AC04-76DP-00613 ..... N80-25429
N80-25449
N80-25548
DE-AC04-76DP-00656 ..... N80-25821
DE-AC04-76DP-00789 ..... N80-26036
N80-26077
N80-26188
DE-AC04-76DP-03533 ..... N80-25420
DE-AC04-77ET-20260 ..... N80-25825
DE-AC04-78CS-45356 ..... N80-25815
DE-AC04-78ET-23063 ..... N80-25800
DE-AC04-79DP-00789 ..... N80-25858
DE-AC05-78ET-53027 ..... N80-26189
DE-AC08-78DP-40067 ..... N80-26168
DE-AC09-76SR-00001 ..... N80-25428
DE-AC11-76PN-00014 ..... N80-25673
DE-AC14-76FF-02170 ..... N80-25709
N80-25710
DE-AC21-78MC-03260 ..... N80-25788
DE-AS09-76EV-00893 ..... N80-25869
DE-AT03-76ET-35300 ..... N80-25704
N80-26096
DE-RP01-79RG-10019 ..... N80-26196
DEN3-30 ..... N80-25792
N80-25793
N80-25794
N80-25795
DEN3-91 ..... N80-26212
DEN3-117 ..... N80-25661
DGRST-76-7-0334 ..... N80-26052
DI-AA551-IA8-39 ..... N80-26023
DI-BM-H0-272017 ..... N80-25774
DI-9-07-85-V00025 ..... N80-26019
DI-14-06-D-7587 ..... N80-26009
N80-26010
DI-14-34-0001-6052 ..... N80-26013
DI-14-34-0001-7005 ..... N80-25949
DI-14-34-0001-7006 ..... N80-25777
DI-14-34-0001-8003 ..... N80-25777
DI-14-34-0001-8007 ..... N80-25777
DI-14-34-0001-8070 ..... N80-25406
DI-14-34-0001-9002 ..... N80-25942
DNA001-78-C-0132 ..... N80-25983
DOT-FA72WA-2901 ..... N80-25525
N80-25314
N80-25315
DOT-FA78WA-4103 ..... N80-25981
DOT-RC-82036 ..... N80-26217
N80-26218
E(11-1)3084-74 ..... N80-25711
E(49-18)-1566 ..... N80-25563
E(49-18)-2330 ..... N80-25836
N80-25838
E(49-18)-2376 ..... N80-25786
EC-77-A-31-1034 ..... N80-25779
EC-77-A-31-1044 ..... N80-25861
N80-25780
N80-26212
EC-77-A-31-1062 ..... N80-25792
N80-25793
N80-25794
N80-25795
EC-77-C-03-1485 ..... N80-25846
N80-25848
EC-77-S-02-4493 ..... N80-25689
EC-77-S-02-4531 ..... N80-25841
EF-77-A-01-2593 ..... N80-25412
EF-77-A-01-2893 ..... N80-25474
N80-25475
EG-77-C-01-4042 ..... N80-25547
N80-25810
N80-25839
N80-25871
N80-25900
N80-25928
N80-26001
EG-77-C-01-4049 ..... N80-25816
N80-25820
N80-25821
EG-77-C-02-4388 ..... N80-25482
EG-77-C-02-4480 ..... N80-25861
EG-77-C-02-4494 ..... N80-25882
EG-77-C-03-1483 ..... N80-25803
N80-25875
N80-25876
EG-77-C-04-3985 ..... N80-25825
EG-77-S-02-4264 ..... N80-26130
EG-77-S-02-4521 ..... N80-25979
EG-77-S-03-1456 ..... N80-26143
EM-78-C-01-5221 ..... N80-25798
EM-78-C-02-4867 ..... N80-26215
EM-78-C-03-1735 ..... N80-25847
EM-78-C-04-4272 ..... N80-25899
EM-78-C-04-4275 ..... N80-25851
EM-78-C-04-4287 ..... N80-25448
EM-78-C-04-5305 ..... N80-25855
EM-78-C-04-5355 ..... N80-25850
EM-78-C-04-5367 ..... N80-25618
EM-78-F-01-5202 ..... N80-25788
EM-78-S-01-5216 ..... N80-25873
EPA-R-800649 ..... N80-25939
EPA-68-02-0609 ..... N80-25937
EPA-68-02-1782 ..... N80-25946
EPA-68-02-2131 ..... N80-25958
EPA-68-02-2185 ..... N80-25947
N80-25957
EPA-68-02-2296 ..... N80-25936
EPA-68-02-2411 ..... N80-25935
EPA-68-02-2593 ..... N80-25950
EPA-68-02-2662 ..... N80-25933
EPA-68-02-3115 ..... N80-25495
EPA-68-03-2388 ..... N80-25944
EPA-68-03-2487 ..... N80-25943
EPA-68-03-2593 ..... N80-25930
N80-25931
EPA-805142 ..... N80-26012
EPA-8038020 ..... N80-25934
EPRI PROJ. 7802 ..... N80-25553
ER-78-C-01-3183 ..... N80-25925
ER-78-C-02-4996 ..... N80-25812
ER-78-S-02-5096 ..... N80-25426
ET-75-1-01-9036 ..... N80-25764
ET-78-C-01-2798 ..... N80-25478
ET-78-C-01-2865 ..... N80-25834

N80-25835
ET-78-C-01-3050 N80-25419
N80-25421
ET-78-C-01-3183 N80-25920
ET-78-C-01-3242 N80-25622
ET-78-C-01-3413 N80-25953
N80-25854
ET-78-C-02-4031 N80-25795
ET-78-C-03-1740 N80-25898
ET-78-C-03-1985 N80-25672
ET-78-C-03-2073 N80-25826
ET-78-C-03-2207 N80-25844
ET-78-C-04-5460 N80-25800
ET-78-I-01-2895 N80-26172
EW-78-I-05-5750 N80-25911
EW-78-S-02-4717 N80-25470
EX-78-A-01-2295 N80-25459
EX-78-A-29-1020 N80-25818
N80-25819
EX-78-A-29-1026 N80-25807
EX-78-C-01-1558 N80-25553
EX-78-C-01-1800 N80-25473
EX-78-C-01-2034 N80-25396
EX-78-C-01-2274 N80-25461
EX-78-C-01-2288 N80-25472
EX-78-C-01-2330 N80-25836
N80-25837
N80-25838
EX-78-C-01-2396 N80-25784
EX-78-C-01-2514 N80-25471
EX-78-S-01-2414 N80-25787
EX-78-S-01-2427 N80-25463
EX-78-S-01-2537 N80-25460
EY-78-A-03-0959 N80-25809
EY-78-C-02-0003 N80-25455
EY-78-C-02-0016 N80-25468
N80-25896
N80-26002
N80-26185
N80-26216
EY-78-C-02-1199 N80-25427
N80-26128
EY-78-C-02-2705 N80-25813
EY-78-C-02-4048 N80-25822
EY-78-C-03-0015 N80-25903
EY-78-C-03-0115 N80-26129
EY-78-C-03-0515 N80-26127
EY-78-C-03-1241 N80-25466
EY-78-C-03-1363 N80-25891
EY-78-C-04-0063 N80-25425
N80-25450
EY-78-C-04-0613 N80-25429
N80-25449
N80-25548
N80-25687
EY-78-C-04-0656 N80-25821
EY-78-C-04-0799 N80-25349
N80-25399
N80-25550
N80-25623
N80-25624
N80-25626
N80-25643
N80-25654
N80-25670
N80-25706
N80-25766
N80-25843
N80-25856
N80-25857
N80-25858
N80-25859
N80-25860
N80-25863
N80-25870
N80-25879
N80-25887
N80-25897
N80-25912
N80-26036
N80-26075
N80-26076
N80-26077
N80-26078
N80-26093
N80-26094
N80-26145
N80-25188
EY-78-C-04-3523 N80-25420
N80-25888
EY-78-C-05-0033 N80-25829
N80-25804
N80-26241
EY-78-C-06-1830 N80-25465
N80-25705
N80-25865
N80-25878
N80-26131
N80-26132
EY-78-C-06-2319 N80-26169
EY-78-C-07-1570 N80-25423
EY-78-C-09-0001 N80-25422
N80-25429
N80-25845
EY-78-C-11-0014 N80-25873
EY-78-C-14-2170 N80-25709
N80-25710
EY-78-S-02-1367 N80-25425
EY-78-S-02-2272 N80-26138
EY-78-S-02-2310 N80-26111
EY-78-S-02-2448 N80-25811
EY-78-S-02-2458 N80-26183
N80-26184
EY-78-S-02-2577 N80-25884
EY-78-S-02-2588 N80-25823
EY-78-S-02-2602 N80-25707
EY-78-S-02-2874 N80-25824
EY-78-S-02-2889 N80-25886
EY-78-S-02-2980 N80-25433
EY-78-S-02-2976 N80-26134
EY-78-S-02-3084 N80-25711
EY-78-S-03-0034 N80-25852
EY-78-S-05-5048 N80-26097
EY-78-S-06-2230-004 N80-25844
EY-78-S-09-0893 N80-25869
FAA PROJ. 045-396-130 N80-25519
FAA PROJ. 181-521-100 N80-25393
FAA PROJ. 213-062-660 N80-25523
FAA-ER-430-015 N80-25484
F19628-76-C-0230 N80-25586
F19628-78-C-0002 N80-25527
F19628-78-C-0008 N80-25361
F19628-78-C-0017 N80-25877
N80-25878
F19628-78-C-0109 N80-26141
F19628-80-C-0001 N80-26082
F19628-80-C-0002 N80-25528
F30602-75-C-0121 N80-25362
F30602-76-C-0282 N80-26046
F30602-77-C-0244 N80-25837
F30602-78-C-0085 N80-26195
F30602-78-C-0148 N80-25884
F30602-78-C-0361 N80-26067
F33615-76-C-2039 N80-25862
F33615-78-C-2014 N80-25336
F33615-78-C-2060 N80-25341
F33615-79-C-0505 N80-26072
F33657-76-C-0723 N80-26070
F49620-77-C-0023 N80-25358
F49620-78-C-0013 N80-26237
GEN. ATOMIC PROJ. 6400 N80-25704
HUD-H-2372 N80-25818
N80-25819
N80-25821
JPL-954149 N80-26240
JPL-954798 N80-25782
JPL-955188 N80-26210
JPL-955190 N80-26203
N80-26204
N80-26205
N80-26206
N80-26207
N80-26208
N80-26209
MDA903-78-C-0038 N80-25323
NASA ORDER T-6231-G N80-26082
NASW-3208 N80-26240
NAS1-13871 N80-25297
NAS1-13884 N80-25334
NAS1-14000 N80-25320
NAS1-14732 N80-25295
NAS1-14855 N80-25298
NAS1-15936 N80-25299
NAS2-9820 N80-25591
NAS3-17787 N80-25415
NAS3-20055 N80-25335
NAS3-20407 N80-25382
NAS3-20639 N80-25332
NAS3-20832 N80-25340
NAS3-20839 N80-25333
NAS3-21359 N80-26109
NAS3-21745 N80-25357
NAS3-21871 N80-25453
NAS5-21798 N80-25757
NAS5-24264 N80-25740
NAS5-24479 N80-25738
NAS5-24489 N80-25358
NAS5-25725 N80-25520
NAS6-2539 N80-26054
NAS7-100 N80-25538
N80-25660
N80-25764
N80-26057
N80-26201
N80-26202
N80-26210
NAS8-30300 N80-25414
NAS8-31543 N80-25354
NAS8-31550 N80-25991
NAS8-32036 N80-25783
N80-25787
N80-25790
N80-25791
NAS8-33433 N80-25982
N80-25993
NAS9-14776 N80-25380
NAS9-15240E N80-25522
NAS9-15240F N80-25522
NAS9-15795 N80-25521
NAS9-15800 N80-26084
N80-26085
NBS-5-35916 N80-25585
NCA2-OR180-704 N80-25824
NGL-25-001-054 N80-25735
NGR-06-002-112 N80-26181
NGR-14-005-181 N80-25984
N80-26242
NR PROJ. 031-790 N80-25417
NR PROJ. 062-629 N80-25884
NR PROJ. 150-389 N80-26085
NRC-FIN-A-0213 N80-25714
NSF AEN-74-22179 N80-25956
NSF AEN-76-14696 N80-25496
NSF AEN-76-19033 N80-25498
NSF AER-74-06381 N80-25480
NSF ATM-77-23757 N80-26007
N80-26008
N80-26016
N80-26017
N80-26018
NSF CA-114 N80-25984
NSF DMR-79-80847 N80-25425
NSF ESR-76-00837 N80-26041
NSF MCS-78-23676 N80-26089
NSF OCE-76-01813 N80-26025
NSF OCE-76-80210 N80-26026
NSF OCE-79-19513 N80-26025
NSF OCE-79-19833 N80-26028
NSF PFR-77-12500 N80-25908
N80-25909
NSF PTP-75-03457 N80-25906
N80-25907
NSF 79-SP-0851 N80-26220
NSG-1143 N80-25330
NSG-1254 N80-25381
NSG-1484 N80-26238
NSG-1535 N80-25760
NSG-1565 N80-26055
NSG-1577 N80-26089
NSG-1612 N80-25294
NSG-2088 N80-25597
NSG-2357 N80-25586
NSG-3197 N80-25383
N80-25384
NSG-3297 N80-25785
NSG-4018 N80-25344
NSG-5080 N80-25737
NSG-5256 N80-25734
NSG-7198 N80-26181
N00014-75-C-0277 N80-25818
N00014-75-C-0812 N80-26194
N00014-76-C-0231 N80-25418
N00014-76-C-0341 N80-26068
N00014-76-C-0370 N80-26069
N00014-76-C-0596 N80-25417
N00014-76-C-0627 N80-26085
N00014-76-C-0706 N80-25888
N00014-77-C-0616 N80-25299
N00014-78-C-0213 N80-25682

N00014-78-C-0852 ..... N80-25702
N00014-78-C-0880 ..... N80-25703
N00014-78-G-0059 ..... N80-25664
N00014-79-C-0755 ..... N80-25682
N00019-78-C-0584 ..... N80-25534
N00024-79-C-6043 ..... N80-25701
N00039-75-C-0451 ..... N80-25645
N00039-76-C-0240 ..... N80-25639
N00123-77-C-1045 ..... N80-25543
N00173-79-C-0098 ..... N80-26142
N62269-79-C-0446 ..... N80-25418
N66001-78-C-3022 ..... N80-25550
RR0420401 ..... N80-26085
SF43411301 ..... N80-26071
SR0230101 ..... N80-25618
T-78-C-01-3815 ..... N80-25925
W-31-109-ENG-38 ..... N80-25363
N80-25365
N80-25402
N80-25403
N80-25477
N80-25548
N80-25631
N80-25640
N80-25642
N80-25685
N80-25687
N80-25712
N80-25801
N80-25802
N80-25814
N80-25827
N80-25828
N80-25829
N80-25830
N80-25831
N80-25866
N80-25867
N80-25872
N80-25890
N80-25894
N80-25895
N80-25923
N80-25927
N80-26038
N80-26162
N80-26166
N80-26167
N80-26171
N80-26187
W-7405-ENG-26 ..... N80-25350
N80-25351
N80-25424
N80-25464
N80-25628
N80-25630
N80-25671
N80-25706
N80-25877
N80-26037
N80-26135
W-7405-ENG-36 ..... N80-25374
N80-25396
N80-25467
N80-25492
N80-25625
N80-25649
N80-25655
N80-25805
N80-25817
N80-25822
N80-25960
N80-26066
N80-26184
N80-26191
N80-26232
W-7405-ENG-48 ..... N80-25376
N80-25400
N80-25404
N80-25432
N80-25489
N80-25529
N80-25530
N80-25549
N80-25619
N80-25627
N80-25641
N80-25650
N80-25651
N80-25652
N80-25653
N80-25668
N80-25714
N80-25845
N80-25849
N80-25880
N80-25881
N80-25882
N80-25883
N80-25804
N80-25805
N80-25921
N80-25981
N80-26003
N80-26005
N80-26106
N80-26133
N80-26144
N80-26165
N80-26170
N80-26186
N80-26213
W-7405-ENG-82 ..... N80-25397
N80-25430
N80-25483
N80-25552
N80-25554
N80-25620
N80-25886
N80-26136
W-7405-ENG-92 ..... N80-25364
WF54591001 ..... N80-25418
XF54586002 ..... N80-25539
146-20-10-07 ..... N80-25382
152-85-00-72 ..... N80-25884
505-01 ..... N80-25835
505-04 ..... N80-25337
N80-25338
505-09-31 ..... N80-26039
505-10-12 ..... N80-25318
505-31-21 ..... N80-25588
505-31-83-01 ..... N80-25814
N80-25815
505-32-22 ..... N80-25333
505-35-21 ..... N80-26040
505-41-13-03 ..... N80-25345
505-42-23-03 ..... N80-25296
505-44-21 ..... N80-25306
506-61-53-01 ..... N80-26125
540-03-13-01 ..... N80-26198
677-85-00-00-72 ..... N80-25965
769-02 ..... N80-25339
953-36-00-00-72 ..... N80-25319
N80-25372

REPORT/ACCESSION NUMBER INDEX

Typical Report/Accession Number Index Listing



Listings in this index are arranged alpha-numerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-7061 ..... N80-25318* #
A-7913 ..... N80-25306* #
A-8057 ..... N80-26039* #
A-8090 ..... N80-25588* #
A-8210 ..... N80-26040* #

AD-A071264 ..... N80-26035 #
AD-A080957 ..... N80-26034 #
AD-A080988 ..... N80-25542 #
AD-A080990 ..... N80-25541 #
AD-A081133 ..... N80-25315 #
AD-A081228 ..... N80-25395 #
AD-A081233 ..... N80-25314 #
AD-A081238 ..... N80-25703 #
AD-A081239 ..... N80-25702 #
AD-A081249 ..... N80-25394 #
AD-A081347 ..... N80-25636 #
AD-A081379 ..... N80-25688 #
AD-A081686 ..... N80-25539 #
AD-A081844 ..... N80-25915 #
AD-A081845 ..... N80-25916 #
AD-A081847 ..... N80-25917 #
AD-A081848 ..... N80-25918 #
AD-A081859 ..... N80-25356 #
AD-A081881 ..... N80-26237 #
AD-A081921 ..... N80-26067 #
AD-A081927 ..... N80-26068 #
AD-A081928 ..... N80-25545 #
AD-A081929 ..... N80-26283 #
AD-A081967 ..... N80-26089 #
AD-A081987 ..... N80-26194 #
AD-A082014 ..... N80-25637 #
AD-A082049 ..... N80-25639 #
AD-A082068 ..... N80-25683 #
AD-A082192 ..... N80-25525 #
AD-A082243 ..... N80-25785 #
AD-A082323 ..... N80-26183 #
AD-A082324 ..... N80-26195 #
AD-A082351 ..... N80-25544 #
AD-A082355 ..... N80-25862 #
AD-A082359 ..... N80-26074 #
AD-A082363 ..... N80-26046 #
AD-A082378 ..... N80-25524 #
AD-A082381 ..... N80-25362 #
AD-A082390 ..... N80-26086 #
AD-A082425 ..... N80-26070 #
AD-A082444 ..... N80-25865 #
AD-A082450 ..... N80-26141 #
AD-A082452 ..... N80-26092 #
AD-A082456 ..... N80-25417 #
AD-A082457 ..... N80-25418 #
AD-A082460 ..... N80-25528 #
AD-A082485 ..... N80-26071 #
AD-A082494 ..... N80-25313 #
AD-A082505 ..... N80-26142 #
AD-A082509 ..... N80-25647 #
AD-A082512 ..... N80-25307 #
AD-A082513 ..... N80-25308 #
AD-A082515 ..... N80-25540 #
AD-A082523 ..... N80-25681 #
AD-A082524 ..... N80-25701 #
AD-A082536 ..... N80-25322 #
AD-A082622 ..... N80-25346 #
AD-A082623 ..... N80-25416 #
AD-A082633 ..... N80-26091 #
AD-A082640 ..... N80-26126 #
AD-A082664 ..... N80-25543 #
AD-A082732 ..... N80-26073 #
AD-A082735 ..... N80-26072 #
AD-A082744 ..... N80-25299* #
AD-A082753 ..... N80-25341 #
AD-A082756 ..... N80-25797 #
AD-A082758 ..... N80-25864 #
AD-A082783 ..... N80-25526 #
AD-A082821 ..... N80-25336 #
AD-A082822 ..... N80-25616 #
AD-A082827 ..... N80-25638 #
AD-A082845 ..... N80-26085 #
AD-A082854 ..... N80-25527 #
AD-A082960 ..... N80-26262 #
AD-A082969 ..... N80-26000 #
AD-A082991 ..... N80-25682 #
AD-A083006 ..... N80-25683 #
AD-A083009 ..... N80-25684 #
AD-A083019 ..... N80-25877 #
AD-A083021 ..... N80-25361 #
AD-A083022 ..... N80-25978 #
AD-A083027 ..... N80-25519 #
AD-A083033 ..... N80-26090 #
AD-A083039 ..... N80-25648 #
AD-A083072 ..... N80-25523 #
AD-A083076 ..... N80-25484 #
AD-A083137 ..... N80-25393 #

AD-E300688 ..... N80-25625 #

AERONOMY-82 ..... N80-25864* #
AERONOMY-83 ..... N80-26242* #

AFAL-TR-79-1231 ..... N80-25313 #

AFAPL-TR-78-6-PT-4 ..... N80-25682 #
AFAPL-TR-79-2064 ..... N80-25341 #
AFAPL-TR-79-2103 ..... N80-25336 #

AFGL-TR-80-0004 ..... N80-25361 #
AFGL-TR-80-0024 ..... N80-25977 #
AFGL-TR-80-0025 ..... N80-25978 #

AFOSR-80-0139TR ..... N80-25636 #
AFOSR-80-0174TR ..... N80-26237 #
AFOSR-80-0220TR ..... N80-25322 #
AFOSR-80-0256TR ..... N80-25346 #

AGARD-AR-152 ..... N80-25347 #

AGARD-HIGHLIGHTS-80/1 ..... N80-26262 #

AGARD-LS-106 ..... N80-25499 #

AGARD-R-685 ..... N80-25325 #

AIRESEARCH-78-15442-2 ..... N80-25334* #
AIRESEARCH-79-18430 ..... N80-26212* #

ALO-3985-1-REV-1 ..... N80-25825 #
ALO-4272 ..... N80-25899 #
ALO-4287-T2 ..... N80-25448 #
ALO-5355-T1 ..... N80-25850 #
ALO-5367-1 ..... N80-25818 #
ALO-35356-1 ..... N80-25815 #

AMP-334 ..... N80-25598* #

AMRL-TR-75-50-VOL-122 ..... N80-25915 #
AMRL-TR-75-50-VOL-144 ..... N80-25916 #
AMRL-TR-75-50-VOL-145 ..... N80-25917 #
AMRL-TR-75-50-VOL-146 ..... N80-25918 #
AMRL-TR-79-119 ..... N80-26035 #
AMRL-TR-80-5 ..... N80-26072 #

ANL/FE-49622 ..... N80-25640 #

ANL-79-51 ..... N80-25895 #
ANL-79-102 ..... N80-25814 #
ANL-79-105 ..... N80-25831 #

ANL/CEN/RSD-79-1 ..... N80-25402 #

ANL/CNSV/TM-29 ..... N80-25890 #

ANL/FPP/TM-125 ..... N80-26171 #

ANL/MHD-79-15 ..... N80-26182* #

ANL/MSD/FE-80-1 ..... N80-25885 #

ANL/OEPM-78-8 ..... N80-25801 #
ANL/OEPM-78-11 ..... N80-25802 #

ANL/PMS-79-2-VOL-1 ..... N80-25827 #
ANL/PMS-79-2-VOL-2 ..... N80-25828 #
ANL/PMS-79-2-VOL-3 ..... N80-25829 #
ANL/PMS-79-2-VOL-4 ..... N80-25830 #
ANL/PMS-79-2-VOL-5 ..... N80-25831 #

ANL/SDP/TM-79-4 ..... N80-25886 #

AR-1 ..... N80-25419 #
AR-2 ..... N80-25781* #
AR-2 ..... N80-25926 #
AR-3 ..... N80-25952 #
AR-001-481 ..... N80-25587 #
AR-001-781 ..... N80-25312 #

ARAP-413 ..... N80-25299* #

ARI-RP-49 ..... N80-25925 #
ARI-RP-52 ..... N80-25920 #

ARL/PSU-TM-80-03 ..... N80-25701 #

ARL/SYS-TM-50 ..... N80-25312 #

ARO-14133.10-C ..... N80-26126 #
ARO-16508.2-GS ..... N80-25848 #
ARO-17293.5-C ..... N80-25394 #
ARO-1911713.1-C ..... N80-25394 #
ARO-1913881.17-M ..... N80-26091 #
ARO-1914505.12-M ..... N80-26092 #

ARO-15194.2-M ..... N80-26090 #

ASD-TR-79-47 ..... N80-26070 #

ASE-4460 ..... N80-25851 #

ATR-78(7735)-1 ..... N80-25358* #
ATR-80(7824)-1 ..... N80-25365 #

AVRADCOM-TM-80-A-1 ..... N80-25318* #

AVRADCOM-TR-80-B-3 ..... N80-25296* #

BBC-RD-1980/2 ..... N80-25512
BBC-RD-1980/3 ..... N80-25518

BDX-613-2341 ..... N80-25429 #
BDX-613-2376 ..... N80-25667 #

BDX-613-2413 ..... N80-25548 #
BDX-613-2414 ..... N80-25449 #

BM-OFR-80-79 ..... N80-25774 #

BM-RI-8403 ..... N80-25940 #
BM-RI-8408 ..... N80-25773 #

BNL-26891 ..... N80-26002 #
BNL-27316 ..... N80-25896 #
BNL-27323 ..... N80-26185 #
BNL-51047 ..... N80-26216 #
BNL-51052 ..... N80-25488 #

BR73312 ..... N80-26029 #
BR74076 ..... N80-25896 #

CAB-OC-79-01 ..... N80-25309 #

CCVS74-VSR525 ..... N80-26080 #

CERT-1/7125-DERA N80-26052

CMU-CS-79-143 ..... N80-26069 #

COMCO-80-TR-1.0 ..... N80-25298* #

COMPLETION-79-22 ..... N80-25983 #

CONF-790276-1 ..... N80-25817 #
CONF-790696-3 ..... N80-26185 #
CONF-790709-4-REV-2 ..... N80-25841 #
CONF-790804-P2 ..... N80-25808 #
CONF-790809-15 ..... N80-26187 #
CONF-790910-5 ..... N80-25422 #
CONF-791005-6 ..... N80-25853 #
CONF-791009-27 ..... N80-25881 #
CONF-791048-4 ..... N80-25670 #
CONF-791075-4 ..... N80-25546 #
CONF-791082-1 ..... N80-25457 #
CONF-791084-1 ..... N80-25825 #
CONF-791103-73 ..... N80-25642 #
CONF-791105-2 ..... N80-25872 #
CONF-791107-2 ..... N80-25549 #
CONF-791108-16 ..... N80-25823 #
CONF-791132-4 ..... N80-25425 #
CONF-791134-8 ..... N80-25403 #
CONF-791143-3 ..... N80-25817 #
CONF-791172-1 ..... N80-25827 #
CONF-791173-1 ..... N80-25552 #
CONF-791204-20 ..... N80-25888 #
CONF-791204-32 ..... N80-25884 #
CONF-791216-2 ..... N80-25859 #
CONF-791220-5 ..... N80-25855 #
CONF-791226-2 ..... N80-25867 #
CONF-791233-2 ..... N80-25849 #
CONF-800101-1 ..... N80-25905 #
CONF-800101-17 ..... N80-25896 #
CONF-800101-20 ..... N80-25900 #
CONF-800103-3 ..... N80-25887 #
CONF-800104-1 ..... N80-25826 #
CONF-800104-5 ..... N80-26186 #
CONF-800104-6 ..... N80-26167 #
CONF-800107-4 ..... N80-26002 #
CONF-800117-1 ..... N80-26135 #
CONF-800123-2 ..... N80-26191 #
CONF-800126-1 ..... N80-26232 #
CONF-800129-2 ..... N80-25477 #
CONF-800205-4 ..... N80-25428 #
CONF-800207-2 ..... N80-25686 #
CONF-800212-2 ..... N80-25871 #
CONF-800214-1 ..... N80-25821 #
CONF-800220-1 ..... N80-25857 #
CONF-800220-2 ..... N80-25860 #
CONF-800229-1 ..... N80-25766 #
CONF-800307-2 ..... N80-25619 #
CONF-800307-3 ..... N80-26145 #
CONF-800316-2 ..... N80-25423 #
CONF-800402-8 ..... N80-26184 #
CONF-800408-2 ..... N80-25897 #
CONF-800410-2 ..... N80-25550 #
CONF-800502-7 ..... N80-25643 #
CONF-7808114 ..... N80-26004 #
CONF-7809197 ..... N80-25363 #
CONF-7903109-1 ..... N80-25620 #
CONF-7905108 ..... N80-25660 #
CONF-7906140-2 ..... N80-26097 #
CONF-7908108-1 ..... N80-25397 #
CONF-7910101-2 ..... N80-25649 #

COO-0003-41-T1 ..... N80-25455 #
COO-1198-1281 ..... N80-26128 #
COO-1367-107 ..... N80-25425 #
COO-2310-6 ..... N80-26111 #
COO-2458-57 ..... N80-26183 #
COO-2458-70 ..... N80-26184 #
COO-2577-19 ..... N80-25864 #
COO-2589-T1 ..... N80-25823 #
COO-2602-7 ..... N80-25707 #
COO-2705-3 ..... N80-25913 #
COO-2869-5 ..... N80-25886 #
COO-2980-4 ..... N80-25433 #
COO-2978-5 ..... N80-26134 #
COO-3084-74 ..... N80-25711 #
COO-4046-2 ..... N80-25822 #
COO-4264-13 ..... N80-26130 #
COO-4368-7 ..... N80-25462 #
COO-4493-5 ..... N80-25889 #
COO-4494-1 ..... N80-25982 #
COO-4521-1 ..... N80-25979 #
COO-4531-9 ..... N80-25841 #
COO-4717-T1 ..... N80-25470 #
COO-4867-05 ..... N80-26215 #
COO-4931-T11 ..... N80-25793 #
COO-4996-1 ..... N80-25912 #
COO-5098 ..... N80-25426 #
COO-10397-01 ..... N80-25401 #
COO-10409-1 ..... N80-26137 #
COO-30122-3 ..... N80-25806 #

CRC-PUB-84 ..... N80-25998 #

CRPE-NT-61 ..... N80-26173 #

CSIR-TRANS-1457 ..... N80-25483 #

CSTR-374 ..... N80-26088 #

DDA-EDR-100 ..... N80-25306 #

DELET-TR-78-2991-2 ..... N80-25541 #
DELET-TR-78-2991-3 ..... N80-25542 #
DELET-TR-78-2992-2 ..... N80-25544 #

DFVLR-FB-79-16 ..... N80-25388 #
DFVLR-FB-79-21 ..... N80-25301 #
DFVLR-FB-79-26 ..... N80-25367 #
DFVLR-FB-79-27 ..... N80-25302 #
DFVLR-FB-79-28 ..... N80-25352 #
DFVLR-FB-79-29 ..... N80-26116 #
DFVLR-FB-79-31 ..... N80-25717 #

DFVLR-MITT-79-03 ..... N80-25275 #
DFVLR-MITT-79-08 ..... N80-25316 #
DFVLR-MITT-79-09 ..... N80-25300 #
DFVLR-MITT-79-12 ..... N80-26006 #

DNA-5044F ..... N80-25525 #

DO-147 ..... N80-25511
DO-160 ..... N80-25329
DO-164 ..... N80-25310

DOC-80SDS4217 ..... N80-25357* #

DOD-MIL-STD-1589A ..... N80-26068 #

DOE/CS-0102/1 ..... N80-26214 #
DOE/CS-0117 ..... N80-25902 #
DOE/CS-0118 ..... N80-25901 #
DOE/CS-0124 ..... N80-25883 #
DOE/CS-0146 ..... N80-25884 #
DOE/CS-4048/2 ..... N80-25822 #
DOE/CS-35305/T1 ..... N80-25855 #

DOE/DP-40067/T1 ..... N80-26168 #

DOE/EA-0065 ..... N80-25929 #

DOE/EDP-0033 ..... N80-25862 #

DOE/ER-0038/1 ..... N80-25874 #
DOE/ER-0038 ..... N80-25364 #
DOE/ER-01198/1299 ..... N80-25427 #
DOE/ER-04972/2 ..... N80-25713 #
DOE/ER-05046/16 ..... N80-26097 #
DOE/ER-70004/258 ..... N80-25644 #

DOE/ET-0118 ..... N80-25824 #
DOE/ET-2865/5 ..... N80-26172 #

DOE/ET-11321/T1 ..... N80-25891 #
DOE/ET-15422/T3 ..... N80-28095 #
DOE/ET-20413/1 ..... N80-26143 #
DOE/ET-23040/1 ..... N80-25882 #
DOE/ET-23063/1 ..... N80-25800 #
DOE/ET-23103 ..... N80-25840 #
DOE/ET-23103/4 ..... N80-25885 #

DOE/EV-0042 ..... N80-25926 #
DOE/EV-0062/1 ..... N80-26003 #

DOE/EY-22874/86 ..... N80-25924 #

DOE/JPL-954796-79/7 ..... N80-25782* #
DOE/JPL-954929-80/7 ..... N80-25781* #

DOE/MC-03260/4 ..... N80-25768 #

DOE/NASA/0030-80/1 ..... N80-25792* #
DOE/NASA/0030-80/2 ..... N80-25793* #
DOE/NASA/0030-80/4 ..... N80-25794* #
DOE/NASA/0030-80/6 ..... N80-25795* #
DOE/NASA/0091-80/1 ..... N80-26212* #
DOE/NASA/0117-80/1 ..... N80-25861* #
DOE/NASA/1034-8 ..... N80-25779* #
DOE/NASA/1044-6 ..... N80-25780* #
DOE/NASA/2593-15 ..... N80-25412* #

DOE/RA-0047 ..... N80-25769 #

DOE/RG-10019/T1 ..... N80-26196 #

DOE/SEA-1109-20401-79/2 ..... N80-25807 #

DOE/TIC-10283 ..... N80-25829 #
DOE/TIC-11096 ..... N80-26241 #
DOE/TIC-11126 ..... N80-25712 #
DOE/TIC-11132 ..... N80-26038 #

DOT-RSPA-MTB-79-13-VOL-1 ..... N80-26217 #
DOT-RSPA-MTB-79-14-VOL-2 ..... N80-26218 #

DP-MS-79-22 ..... N80-25422 #
DP-MS-79-64 ..... N80-25428 #

DP-1537 ..... N80-25645 #

DRSMI-RE-CR-80-1 ..... N80-25847 #

DSE-3413-T2 ..... N80-25853 #
DSE-3413-T3 ..... N80-25854 #
DSE-4042-T11 ..... N80-25871 #
DSE-5218-T4 ..... N80-25873 #
DSE-5221-T1 ..... N80-25798 #

DTNSRDC-80/038 ..... N80-26071 #

D180-24700-1 ..... N80-26070 #

E-315 ..... N80-25338* #
E-316 ..... N80-25337* #
E-354 ..... N80-25835* #
E-432 ..... N80-26115* #
E-433 ..... N80-25454* #
E-454 ..... N80-25780* #
E-457 ..... N80-25779* #

EC/2405801-FR-1 ..... N80-26041 #

ECDP/B-5 ..... N80-25481 #

EDR-10119-VOL-1 ..... N80-25335* #

EFI-79-42 ..... N80-25811 #

EMD-80-14 ..... N80-25910 #

EPA-68-02-2484 ..... N80-25955 #
EPA-340/1-80-004 ..... N80-25952 #
EPA-450/3-79-024 ..... N80-25948 #
EPA-450/4-79-017 ..... N80-25933 #
EPA-450/4-79-020 ..... N80-25919 #
EPA-450/4-79-032 ..... N80-25950 #
EPA-460/3-78-011A ..... N80-25930 #
EPA-460/3-78-011B ..... N80-25931 #
EPA-460/3-79-011 ..... N80-25944 #
EPA-600/2-79-141-VOL-4 ..... N80-25837 #
EPA-600/2-79-202 ..... N80-25947 #
EPA-600/2-79-205 ..... N80-25846 #
EPA-600/2-80-023 ..... N80-25955 #

EPA-600/3-79-107 ..... N80-25934 #
EPA-600/3-79-110 ..... N80-25939 #
EPA-600/3-80-023 ..... N80-25945 #
EPA-600/4-79-047 ..... N80-25953 #
EPA-600/4-79-054 ..... N80-25951 #
EPA-600/4-79-056 ..... N80-25941 #
EPA-600/4-79-058 ..... N80-25954 #
EPA-600/4-80-001 ..... N80-26012 #
EPA-600/7-79-153 ..... N80-25957 #
EPA-600/7-79-239 ..... N80-25496 #
EPA-600/7-79-242 ..... N80-25935 #
EPA-600/7-79-250 ..... N80-25481 #
EPA-600/7-79-255 ..... N80-25843 #

EPRI-EL-1284 ..... N80-25553 #

ERADCOM/ASL-DR-1104 ..... N80-26000 #

ERG-79-3 ..... N80-25892 #

ESA-TT-611 ..... N80-25719 #
ESA-TT-613 ..... N80-25485 #
ESA-TT-632 ..... N80-26255 #
ESA-TT-640 ..... N80-25316 #
ESA-TT-641 ..... N80-25300 #
ESA-TT-642 ..... N80-26006 #
ESA-TT-643 ..... N80-25366 #
ESA-TT-644 ..... N80-25301 #
ESA-TT-645 ..... N80-25367 #
ESA-TT-646 ..... N80-25302 #
ESA-TT-647 ..... N80-25352 #
ESA-TT-648 ..... N80-26116 #
ESA-TT-649 ..... N80-25717 #

ESD-TR-79-162 ..... N80-25527 #
ESD-TR-79-284 ..... N80-25528 #

ESG-DOE-13259 ..... N80-25861 #

ESG-79-2-VOL-1 ..... N80-25875 #
ESG-79-2-VOL-2-BK-1 ..... N80-25876 #
ESG-79-2-VOL-4 ..... N80-25803 #

ESN-34-1 ..... N80-26263 #

ETTR-52 ..... N80-25414* #

E80-10151 ..... N80-25733* #
E80-10152 ..... N80-25734* #
E80-10153 ..... N80-25735* #
E80-10160 ..... N80-25736* #
E80-10161 ..... N80-25737* #
E80-10163 ..... N80-25738* #
E80-10164 ..... N80-25739* #
E80-10165 ..... N80-25740* #
E80-10166 ..... N80-25741* #
E80-10167 ..... N80-25742* #

FAA-NA-79-46 ..... N80-25393 #
FAA-NA-80-2 ..... N80-25523 #
FAA-NA-80-8 ..... N80-25519 #

FAA-RD-79-93 ..... N80-25484 #
FAA-RD-80-10 ..... N80-25681 #
FAA-RD-80-11 ..... N80-25523 #
FAA-RD-80-18 ..... N80-25519 #

FE-MIT-2295T26-9 ..... N80-25459 #

FE-1800-42 ..... N80-25473 #
FE-2034-17 ..... N80-25398 #
FE-2274-7 ..... N80-25461 #
FE-2286-44 ..... N80-25472 #
FE-2414-8 ..... N80-25767 #
FE-2437-T1-ADD ..... N80-25463 #
FE-2514-M4 ..... N80-25471 #
FE-2537-10 ..... N80-25460 #
FE-2798-74 ..... N80-25476 #
FE-2893-33 ..... N80-25474 #
FE-2893-37 ..... N80-25475 #
FE-3050-T2 ..... N80-25421 #
FE-3242-8 ..... N80-25622 #

FHWA/VA-80/2 ..... N80-25932 #

FR-4500-01-80 ..... N80-26210* #
FR-4500-09-79-11 ..... N80-26202* #

GA-A-15143 ..... N80-26096 #
GA-A-15573 ..... N80-25704 #

GEPP-OP-474 ..... N80-25621 #

GOTEC-01 ..... N80-25921 #

GPO-54-508 ..... N80-25348 #
GPO-59-896 ..... N80-26199 #

HAC-FR-79-14-353 ..... N80-25541 #
HAC-FR-79-14-1376 ..... N80-25542 #

HEDL-TME-79-51 ..... N80-25710 #
HEDL-TME-79-85 ..... N80-25709 #

HSER-7968 ..... N80-25382* #

IFSM-80-102 ..... N80-25383* #
IFSM-80-103 ..... N80-25384* #

IIASA-CP-78-14 ..... N80-25720

IITRI-M6001-82 ..... N80-25415* #

INPE 1636-RPE/095 ..... N80-26243 #

INPE-1648-RPE/102-REV ..... N80-26088 #
INPE-1665-RPE/105 ..... N80-26254 #
INPE-1667-RPE/106 ..... N80-25973 #
INPE-1669-RPE/107 ..... N80-25914 #
INPE-1670-RPE/108 ..... N80-25996 #
INPE-1671-TDL/016 ..... N80-25976 #
INPE-1672-TDL/017 ..... N80-25909 #
INPE-1674-RPE/109 ..... N80-26178 #
INPE-1675-RPE/110 ..... N80-25874 #
INPE-1676-TDL/019 ..... N80-26086 #
INPE-1678-RPE/111 ..... N80-26060 #
INPE-1679-RPE/112 ..... N80-26179 #
INPE-1680-TDL/020 ..... N80-25796 #
INPE-1681-RPE/113 ..... N80-25999 #
INPE-1683-RPE/114 ..... N80-25875 #
INPE-1684-RPE/115 ..... N80-26180 #
INPE-1685-RPE/116-REV ..... N80-25391 #
INPE-1686-RPE/117-REV ..... N80-26033 #
INPE-1687-RPE/118 ..... N80-25868 #
INPE-1692-TDL/022 ..... N80-26197 #
INPE-1693-RPE/120-REV ..... N80-26253 #
INPE-1704-RPE/122-REV ..... N80-26151 #
INPE-1718-RPE/124 ..... N80-26059 #
INPE-1720-RPE/125 ..... N80-25990 #
INPE-1721-RPE/126 ..... N80-26063 #
INPE-1722-RPE/127 ..... N80-25969 #
INPE-1723-RPE/128-REV ..... N80-26152 #
INPE-1724-RPE/129-REV ..... N80-26153 #
INPE-1725-RPE/130 ..... N80-26062 #
INPE-1726-NTE/158-REV ..... N80-26124 #
INPE-1727-NTE/159 ..... N80-25995 #
INPE-1728-TDL/024 ..... N80-26061 #
INPE-1729-TDL/025 ..... N80-25997 #
INPE-1731-RPE/131 ..... N80-26084 #
INPE-1733-RPE/133-REV ..... N80-26083 #
INPE-1735-RPE/135 ..... N80-26177 #
INPE-1737-RPE/136 ..... N80-25970 #
INPE-1738-RPE/137-REV ..... N80-26140 #
INPE-1747-RPE/140 ..... N80-25971 #
INPE-1748-RPE/141 ..... N80-25972 #
INPE-1749-RPE/142-REV ..... N80-25359 #

IPF-79-6 ..... N80-25656 #

IPPJ-447 ..... N80-26154 #
IPPJ-448 ..... N80-26155 #
IPPJ-449 ..... N80-26156 #
IPPJ-450 ..... N80-26157 #
IPPJ-451 ..... N80-26158 #
IPPJ-452 ..... N80-26160 #
IPPJ-453 ..... N80-26159 #

IR-1 ..... N80-25981 #
IR-2 ..... N80-25541 #
IR-2 ..... N80-25544 #
IR-3 ..... N80-25542 #

IS-T-677 ..... N80-26136 #
IS-T-686 ..... N80-25896 #
IS-T-693 ..... N80-25430 #
IS-T-694 ..... N80-25493 #
IS-T-695 ..... N80-25554 #

ISBN-0-309-02984-8 ..... N80-26079 #
ISBN-92-835-1353-3 ..... N80-25347 #
ISBN-92-835-1354-1 ..... N80-25325 #
ISBN-92-835-1357-6 ..... N80-25439 #

ISD-251 ..... N80-25696 #

ISM-243 ..... N80-25367 #
ISM-253 ..... N80-25620 #
ISM-262 ..... N80-25852 #

ISSN-80-10938 ..... N80-26079 #
ISSN-0025-3367 ..... N80-26011 #
ISSN-0143-7003 ..... N80-25634 #

ITT-79-35-04B ..... N80-25702 #
ITT-79-37-11 ..... N80-25703 #

JPL-PUB-79-122 ..... N80-25764* #
JPL-PUB-80-16 ..... N80-26057* #

JPL-9950-37 ..... N80-26201* #
JPL-9950-334 ..... N80-26206* #
JPL-9950-334-APP-A ..... N80-26207* #
JPL-9950-334-APP-B-VOL-1 ..... N80-26203* #
JPL-9950-334-APP-B-VOL-2 ..... N80-26204* #
JPL-9950-334-APP-B-VOL-3 ..... N80-26205* #
JPL-9950-334-APP-C ..... N80-26208* #
JPL-9950-334-APP-D ..... N80-26209* #
JPL-9950-337 ..... N80-26202* #
JPL-9950-337 ..... N80-26210* #
JPL-9950-338 ..... N80-25781* #
JPL-9950-342 ..... N80-25782* #

JSC-11746 ..... N80-25369* #
JSC-14483 ..... N80-25371* #
JSC-14898 ..... N80-25360* #
JSC-16494 ..... N80-26082* #
JSC-16497 ..... N80-25319* #
JSC-16498 ..... N80-25965* #
JSC-16500 ..... N80-26064* #
JSC-16507 ..... N80-26087* #
JSC-16516 ..... N80-25369* #
JSC-16522 ..... N80-25370* #
JSC-16881 ..... N80-25366*

K/CSD-4 ..... N80-25628 #

L-13054 ..... N80-25345* #
L-13297 ..... N80-26198* #
L-13350 ..... N80-25814* #
L-13363 ..... N80-25296* #
L-13437 ..... N80-25815* #
L-13544 ..... N80-25321* #
L-13550 ..... N80-25392* #
L-13768 ..... N80-26125* #

LA-UR-79-2990 ..... N80-25625 #
LA-UR-79-2993 ..... N80-25467 #
LA-UR-80-109 ..... N80-25649 #
LA-UR-80-172 ..... N80-25686 #
LA-UR-80-184 ..... N80-25817 #
LA-UR-80-263 ..... N80-26066 #
LA-UR-80-417 ..... N80-25655 #
LA-UR-80-458 ..... N80-26184 #
LA-UR-80-463 ..... N80-26232 #
LA-UR-80-482 ..... N80-26191 #

LA-8062 ..... N80-25396 #
LA-8134 ..... N80-25492 #
LA-8141-MS ..... N80-25374 #
LA-8144-C ..... N80-25980 #
LA-8199-PR ..... N80-25805 #
LA-8233-MS ..... N80-25922 #
LA-8262-MS ..... N80-26170 #

LBL-8945 ..... N80-25921 #
LBL-9383 ..... N80-25881 #
LBL-9471 ..... N80-26186 #
LBL-9630 ..... N80-25904 #
LBL-9809 ..... N80-25400 #
LBL-9816 ..... N80-25849 #
LBL-9905 ..... N80-25627 #
LBL-9920 ..... N80-25549 #
LBL-10197 ..... N80-25845 #

LC-62-37059 ..... N80-25377 #
LC-79-600191 ..... N80-25564 #
LC-79-600194 ..... N80-25565 #
LC-79-607043 ..... N80-25773 #
LC-80-600001 ..... N80-26219 #

LEMSCO-14571 ..... N80-26084* #

LEWSCO-14596 ..... N80-26085* #

LG77FR8028 ..... N80-25297* #

LMSC-D678155 ..... N80-25882 #

LPC-84 ..... N80-25715 #
LPC-89 ..... N80-25716 #

LR-29293 ..... N80-25419 #

LSU-5029 ..... N80-26034 #

MC-TW-180/79 ..... N80-26096 #

MC-ZW-105/79 ..... N80-26089 #

MERADCOM-2285 ..... N80-25395 #

MIL-STD-1589 ..... N80-26098 #

MIT-NRL-960 ..... N80-25426 #

MLM-2647 ..... N80-25450 #
MLM-2696 ..... N80-25405 #

MLS-BCD-R-2801-1-VOL-1 ..... N80-25314 #
MLS-BCD-R-2801-1-VOL-2-APP ..... N80-25315 #

MRC-DA-804 ..... N80-25815 #

MR-79-FR-1566 ..... N80-25835 #

MSNW-79-1045-5 ..... N80-26169 #

MT-135 ..... N80-25687 #

M80-7 ..... N80-26082* #

NADC-78185-60 ..... N80-25418 #

NASA-CASE-LAR-12260-1 ..... N80-25693* #

NASA-CASE-NPO-15102-1 ..... N80-25638* #
NASA-CASE-NPO-15115-1 ..... N80-25660* #

NASA-CP-2116 ..... N80-25742* #
NASA-CP-2121 ..... N80-25586* #
NASA-CP-2136 ..... N80-26125* #

NASA-CR-3192 ..... N80-25297* #
NASA-CR-3243 ..... N80-25295* #
NASA-CR-3277 ..... N80-26240* #
NASA-CR-3297 ..... N80-25330* #
NASA-CR-3301 ..... N80-25299* #
NASA-CR-156867 ..... N80-26054* #
NASA-CR-158039 ..... N80-25334* #
NASA-CR-158286 ..... N80-25320* #
NASA-CR-159525 ..... N80-25340* #
NASA-CR-159556 ..... N80-25333* #
NASA-CR-159571 ..... N80-25362* #
NASA-CR-159759 ..... N80-25792* #
NASA-CR-159760 ..... N80-25793* #
NASA-CR-159762 ..... N80-25794* #
NASA-CR-159764 ..... N80-25795* #
NASA-CR-159771 ..... N80-26212* #
NASA-CR-159778 ..... N80-25357* #
NASA-CR-159803 ..... N80-25661* #
NASA-CR-159806 ..... N80-25332* #
NASA-CR-159831 ..... N80-25335* #
NASA-CR-159837 ..... N80-26105* #
NASA-CR-159842 ..... N80-25415* #
NASA-CR-159849 ..... N80-26161* #
NASA-CR-159850 ..... N80-25453* #
NASA-CR-159860 ..... N80-25384* #
NASA-CR-159870 ..... N80-25383* #
NASA-CR-159877 ..... N80-25358* #
NASA-CR-160081 ..... N80-25521* #
NASA-CR-160082 ..... N80-25522* #
NASA-CR-160083 ..... N80-25380* #
NASA-CR-160093 ..... N80-26082* #
NASA-CR-160094 ..... N80-26065* #
NASA-CR-160095 ..... N80-26064* #
NASA-CR-161431 ..... N80-25414* #
NASA-CR-161437 ..... N80-25786* #
NASA-CR-161442 ..... N80-25784* #
NASA-CR-161443 ..... N80-25788* #
NASA-CR-161449 ..... N80-25783* #
NASA-CR-161450 ..... N80-25787* #
NASA-CR-161464 ..... N80-25790* #

NASA-CR-161465 ..... N80-25791* #
NASA-CR-161472 ..... N80-25991* #
NASA-CR-161473 ..... N80-25354* #
NASA-CR-161474 ..... N80-25992* #
NASA-CR-161475 ..... N80-25993* #
NASA-CR-162943 ..... N80-25719* #
NASA-CR-163062 ..... N80-25824* #
NASA-CR-163068 ..... N80-25323* #
NASA-CR-163089 ..... N80-25290* #
NASA-CR-163168 ..... N80-25733* #
NASA-CR-163169 ..... N80-25734* #
NASA-CR-163170 ..... N80-25735* #
NASA-CR-163176 ..... N80-25736* #
NASA-CR-163178 ..... N80-25737* #
NASA-CR-163180 ..... N80-25738* #
NASA-CR-163181 ..... N80-25739* #
NASA-CR-163182 ..... N80-25740* #
NASA-CR-163183 ..... N80-25741* #
NASA-CR-163204 ..... N80-25353* #
NASA-CR-163206 ..... N80-25344* #
NASA-CR-163207 ..... N80-25520* #
NASA-CR-163208 ..... N80-25782* #
NASA-CR-163209 ..... N80-25781* #
NASA-CR-163210 ..... N80-25964* #
NASA-CR-163211 ..... N80-26242* #
NASA-CR-163214 ..... N80-25586* #
NASA-CR-163215 ..... N80-26238* #
NASA-CR-163217 ..... N80-25294* #
NASA-CR-163218 ..... N80-25795* #
NASA-CR-163227 ..... N80-26203* #
NASA-CR-163228 ..... N80-26204* #
NASA-CR-163229 ..... N80-26205* #
NASA-CR-163230 ..... N80-26206* #
NASA-CR-163231 ..... N80-26207* #
NASA-CR-163232 ..... N80-26208* #
NASA-CR-163233 ..... N80-26209* #
NASA-CR-163235 ..... N80-26210* #
NASA-CR-163236 ..... N80-26099* #
NASA-CR-163237 ..... N80-25760* #
NASA-CR-163238 ..... N80-26055* #
NASA-CR-163239 ..... N80-25381* #
NASA-CR-163240 ..... N80-26181* #
NASA-CR-163258 ..... N80-26057* #
NASA-CR-163259 ..... N80-25764* #
NASA-CR-163311 ..... N80-25770* #
NASA-CR-163330 ..... N80-26201* #
NASA-CR-163331 ..... N80-26202* #

NASA-SP-444 ..... N80-26239* #
NASA-SP-7011(207) N80-26032*
NASA-SP-7037(122) N80-25274*

NASA-TM-58223 ..... N80-25372* #
NASA-TM-58224 ..... N80-25994* #
NASA-TM-58226 ..... N80-25319* #
NASA-TM-58227 ..... N80-25965* #
NASA-TM-73285 ..... N80-26193*
NASA-TM-73286 ..... N80-26023* #
NASA-TM-78276 ..... N80-25413* #
NASA-TM-78277 ..... N80-25613* #
NASA-TM-78278 ..... N80-25355* #
NASA-TM-78279 ..... N80-26056* #
NASA-TM-78909 ..... N80-25306* #
NASA-TM-80212 ..... N80-25614* #
NASA-TM-80229 ..... N80-26196* #
NASA-TM-80575 ..... N80-26252* #
NASA-TM-80640 ..... N80-25761* #
NASA-TM-80656 ..... N80-25989* #
NASA-TM-80662 ..... N80-25763* #
NASA-TM-80672 ..... N80-25762* #
NASA-TM-80674 ..... N80-26229* #
NASA-TM-80675 ..... N80-26230* #
NASA-TM-80677 ..... N80-25780* #
NASA-TM-80679 ..... N80-25967* #
NASA-TM-80689 ..... N80-26251* #
NASA-TM-80690 ..... N80-26053* #
NASA-TM-80694 ..... N80-26235* #
NASA-TM-80696 ..... N80-26231* #
NASA-TM-80697 ..... N80-26045* #
NASA-TM-80707 ..... N80-26236* #
NASA-TM-80708 ..... N80-26228* #
NASA-TM-80796 ..... N80-25370* #
NASA-TM-80903 ..... N80-26162* #
NASA-TM-81000 ..... N80-25360* #
NASA-TM-81001 ..... N80-25368*
NASA-TM-81072 ..... N80-25369* #
NASA-TM-81073 ..... N80-26087* #
NASA-TM-81077 ..... N80-25371* #
NASA-TM-81206 ..... N80-26040* #
NASA-TM-81494 ..... N80-26115* #

NASA-TM-81496 ..... N80-25454* #
NASA-TM-81513 ..... N80-25780* #
NASA-TM-81514 ..... N80-25779* #
NASA-TM-81520 ..... N80-25412* #
NASA-TM-81526 ..... N80-26182* #
NASA-TM-81978 ..... N80-25986* #

NASA-TP-1618 ..... N80-26039* #
NASA-TP-1636 ..... N80-25345* #
NASA-TP-1656 ..... N80-25296* #
NASA-TP-1666 ..... N80-25321* #
NASA-TP-1673 ..... N80-25392* #
NASA-TP-1680 ..... N80-25337* #
NASA-TP-1682 ..... N80-25615* #
NASA-TP-1686 ..... N80-25635* #
NASA-TP-1688 ..... N80-25336* #
NASA-TP-1692 ..... N80-25339* #
NASA-TP-1696 ..... N80-25318* #

NBS-SP-400-43 ..... N80-25984 #
NBS-SP-400-56 ..... N80-25585 #
NBS-SP-432 ..... N80-25494 #

NBS-TN-1100 ..... N80-25496 #

NBSIR-79-1951 ..... N80-25911 #

NCAR/CT-57 ..... N80-26017 #

NCAR/TN-146 ..... N80-26016 #
NCAR/TN-147 ..... N80-26007 #
NCAR/TN-149 ..... N80-26018 #
NCAR/TN-150 ..... N80-26008 #

NMAB-351 ..... N80-25323* #

NOAA-TM-NESS-107 ..... N80-25772 #

NOAA-TM-NOS-NGS-23 ..... N80-25776 #

NOAA-TR-ERL-407 ..... N80-26014 #

NOAA-79122602 ..... N80-26014 #
NOAA-79122607 ..... N80-26011 #
NOAA-79122801 ..... N80-26244 #
NOAA-79122802 ..... N80-26245 #
NOAA-80010801 ..... N80-25776 #
NOAA-80010809 ..... N80-25772 #
NOAA-80021221 ..... N80-26015 #

NOSC/TR-5 ..... N80-25543 #

NOSL-MT-053 ..... N80-25663 #

NPL-CHEM-110 ..... N80-25634 #

NRNL/NUREG-64 ..... N80-25706 #

NSF/IDOE-79-127 ..... N80-26024 #

NSF/IDOE/CUEA/TR-59 ..... N80-26024 #

NSF/PRA-7800637 ..... N80-26041 #

NSF/RA-790178 ..... N80-25956 #
NSF/RA-790221 ..... N80-25480 #
NSF/RA-790297 ..... N80-25909 #
NSF/RA-790330 ..... N80-25906 #
NSF/RA-790331 ..... N80-25907 #
NSF/RA-790354 ..... N80-25984 #

NSF/RA/790088 ..... N80-25905 #

NSWC/DL-TR-3849 ..... N80-25638 #

NTIS/PS-76/0971 ..... N80-25680 #
NTIS/PS-77/0004 ..... N80-25440 #
NTIS/PS-77/0006 ..... N80-25461 #
NTIS/PS-77/0026 ..... N80-26020 #
NTIS/PS-77/0042 ..... N80-26107 #
NTIS/PS-77/0067 ..... N80-25303 #
NTIS/PS-77/0068 ..... N80-25451 #
NTIS/PS-77/0070 ..... N80-25452 #
NTIS/PS-77/0081 ..... N80-25771 #
NTIS/PS-77/0084 ..... N80-25342 #
NTIS/PS-77/0085 ..... N80-25343 #
NTIS/PS-77/0089 ..... N80-25557 #
NTIS/PS-77/0091 ..... N80-25559 #
NTIS/PS-77/0104 ..... N80-25676 #
NTIS/PS-77/0106 ..... N80-25560 #

NTIS/PS-77/0137 ..... N80-25661 #
NTIS/PS-77/0139 ..... N80-26189 #
NTIS/PS-77/0141 ..... N80-26190 #
NTIS/PS-77/0156 ..... N80-25674 #
NTIS/PS-77/0157 ..... N80-25675 #
NTIS/PS-77/0158 ..... N80-25555 #
NTIS/PS-77/0159 ..... N80-25556 #
NTIS/PS-77/0160 ..... N80-25436 #
NTIS/PS-77/0161 ..... N80-25438 #
NTIS/PS-77/0181 ..... N80-25832 #
NTIS/PS-77/0183 ..... N80-25442 #
NTIS/PS-77/0201 ..... N80-26192 #
NTIS/PS-77/0202 ..... N80-25586 #
NTIS/PS-77/0219 ..... N80-25304 #
NTIS/PS-77/0220 ..... N80-25562 #
NTIS/PS-77/0222 ..... N80-25563 #
NTIS/PS-77/0250 ..... N80-26246 #
NTIS/PS-77/1123 ..... N80-25680 #
NTIS/PS-78/0022 ..... N80-26107 #
NTIS/PS-78/0028 ..... N80-26020 #
NTIS/PS-78/0054 ..... N80-25479 #
NTIS/PS-78/0070 ..... N80-25771 #
NTIS/PS-78/0073 ..... N80-25557 #
NTIS/PS-78/0075 ..... N80-25559 #
NTIS/PS-78/0090 ..... N80-25451 #
NTIS/PS-78/0091 ..... N80-25452 #
NTIS/PS-78/0096 ..... N80-25440 #
NTIS/PS-78/0097 ..... N80-25441 #
NTIS/PS-78/0109 ..... N80-25676 #
NTIS/PS-78/0122 ..... N80-25303 #
NTIS/PS-78/0163 ..... N80-25434 #
NTIS/PS-78/0164 ..... N80-25435 #
NTIS/PS-78/0167 ..... N80-25342 #
NTIS/PS-78/0168 ..... N80-25343 #
NTIS/PS-78/0174 ..... N80-25555 #
NTIS/PS-78/0175 ..... N80-25556 #
NTIS/PS-78/0184 ..... N80-25674 #
NTIS/PS-78/0186 ..... N80-25675 #
NTIS/PS-78/0189 ..... N80-25632 #
NTIS/PS-78/0190 ..... N80-25633 #
NTIS/PS-78/0199 ..... N80-25436 #
NTIS/PS-78/0201 ..... N80-25438 #
NTIS/PS-78/0211 ..... N80-25562 #
NTIS/PS-78/0212 ..... N80-25563 #
NTIS/PS-78/0218 ..... N80-25560 #
NTIS/PS-78/0219 ..... N80-25561 #
NTIS/PS-78/0225 ..... N80-25566 #
NTIS/PS-78/0227 ..... N80-26189 #
NTIS/PS-78/0228 ..... N80-26190 #
NTIS/PS-78/0233 ..... N80-25442 #
NTIS/PS-78/0239 ..... N80-25304 #
NTIS/PS-78/0253 ..... N80-26192 #
NTIS/PS-78/0316 ..... N80-25487 #
NTIS/PS-78/0320 ..... N80-25305 #
NTIS/PS-78/1278 ..... N80-25680 #
NTIS/PS-79/0018 ..... N80-26020 #
NTIS/PS-79/0030 ..... N80-25479 #
NTIS/PS-79/0037 ..... N80-25676 #
NTIS/PS-79/0038 ..... N80-25678 #
NTIS/PS-79/0039 ..... N80-25679 #
NTIS/PS-79/0045 ..... N80-25557 #
NTIS/PS-79/0047 ..... N80-25559 #
NTIS/PS-79/0081 ..... N80-26107 #
NTIS/PS-79/0095 ..... N80-25451 #
NTIS/PS-79/0097 ..... N80-25452 #
NTIS/PS-79/0120 ..... N80-25633 #
NTIS/PS-79/0142 ..... N80-25555 #
NTIS/PS-79/0145 ..... N80-25556 #
NTIS/PS-79/0156 ..... N80-25674 #
NTIS/PS-79/0157 ..... N80-25675 #
NTIS/PS-79/0166 ..... N80-25303 #
NTIS/PS-79/0177 ..... N80-25440 #
NTIS/PS-79/0179 ..... N80-25441 #
NTIS/PS-79/0180 ..... N80-25439 #
NTIS/PS-79/0181 ..... N80-26246 #
NTIS/PS-79/0183 ..... N80-26192 #
NTIS/PS-79/0192 ..... N80-25560 #
NTIS/PS-79/0193 ..... N80-25561 #
NTIS/PS-79/0196 ..... N80-25566 #
NTIS/PS-79/0199 ..... N80-25632 #
NTIS/PS-79/0206 ..... N80-25771 #
NTIS/PS-79/0208 ..... N80-25442 #
NTIS/PS-79/0210 ..... N80-25562 #
NTIS/PS-79/0212 ..... N80-25563 #
NTIS/PS-79/0213 ..... N80-26189 #
NTIS/PS-79/0215 ..... N80-26190 #
NTIS/PS-79/0220 ..... N80-25436 #
NTIS/PS-79/0221 ..... N80-25438 #
NTIS/PS-79/0222 ..... N80-25434 #
NTIS/PS-79/0223 ..... N80-25435 #
NTIS/PS-79/0248 ..... N80-25342 #
NTIS/PS-79/0249 ..... N80-25343 #
NTIS/PS-79/0265 ..... N80-25304 #
NTIS/PS-79/0359 ..... N80-25497 #
NTIS/PS-79/0368 ..... N80-25305 #

NTIS/PS—78/0241 ..... N80-26246 #

NUREG-CR-0912-VOL-1 ..... N80-26133 #
NUREG-CR-1038 ..... N80-25714 #
NUREG-CR-1098 ..... N80-25432 #
NUREG-CR-1158 ..... N80-25710 #
NUREG-CR-1171 ..... N80-25709 #
NUREG-CR-1230 ..... N80-25631 #
NUREG-CR-1351 ..... N80-25706 #

NZERDC-46 ..... N80-25456 #
NZERDC-46-APP ..... N80-25457 #

ONERA-NT-1979-5 ..... N80-25485 #
ONERA-NT-1979-6 ..... N80-25718 #
ONERA-NT-1979-8 ..... N80-26255 #

ONERA-1979-77 ..... N80-25896 #

ORAU/IEA(M)-79-20 ..... N80-25804 #

ORC-79-17 ..... N80-25683 #

ORI-TR-1579 ..... N80-25520* #

ORI/TR-1552-VOL-1 ..... N80-26217 #
ORI/TR-1552-VOL-2 ..... N80-26218 #

ORNL/CON-34 ..... N80-25630 #

ORNL/CSD-42 ..... N80-25677 #

ORNL/SUB-7240/6 ..... N80-25464 #

ORNL/TM-6864 ..... N80-25350 #
ORNL/TM-6865 ..... N80-25351 #
ORNL/TM-7077 ..... N80-25551 #
ORNL/TM-7116 ..... N80-25434 #

OTA-T-106 ..... N80-26219 #

OWRT-A-064-ALAS(3) ..... N80-25983 #
OWRT-A-069-WIS(1) ..... N80-25949 #
OWRT-A-072-CONN(1) ..... N80-25406 #
OWRT-A-0730ARIZ(2) ..... N80-25777 #

OWRT-B-018-DEL(2) ..... N80-25942 #

PB80-129182 ..... N80-25496 #
PB80-131634 ..... N80-26220 #
PB80-131949 ..... N80-25946 #
PB80-132384 ..... N80-25939 #
PB80-132681 ..... N80-25949 #
PB80-133101 ..... N80-26009 #
PB80-134471 ..... N80-26010 #
PB80-134836 ..... N80-25940 #
PB80-135122 ..... N80-25406 #
PB80-137227 ..... N80-25955 #
PB80-137672 ..... N80-26200 #
PB80-137961 ..... N80-25943 #
PB80-138191 ..... N80-25957 #
PB80-138308 ..... N80-25932 #
PB80-138407 ..... N80-25309 #
PB80-138464 ..... N80-25947 #
PB80-138472 ..... N80-26217 #
PB80-138480 ..... N80-26218 #
PB80-138597 ..... N80-25944 #
PB80-139058 ..... N80-25935 #
PB80-139066 ..... N80-25945 #
PB80-139330 ..... N80-25495 #
PB80-139843 ..... N80-26024 #
PB80-139918 ..... N80-25933 #
PB80-140262 ..... N80-25948 #
PB80-140973 ..... N80-25908 #
PB80-140981 ..... N80-25909 #
PB80-141633 ..... N80-25937 #
PB80-141781 ..... N80-25936 #
PB80-142268 ..... N80-26041 #
PB80-142706 ..... N80-25934 #
PB80-143068 ..... N80-26016 #
PB80-143118 ..... N80-26018 #
PB80-143175 ..... N80-25910 #
PB80-143209 ..... N80-25291 #
PB80-143225 ..... N80-25324 #
PB80-143233 ..... N80-26007 #
PB80-143241 ..... N80-26008 #
PB80-143266 ..... N80-25498 #
PB80-143928 ..... N80-26017 #
PB80-143936 ..... N80-25774 #
PB80-144363 ..... N80-25906 #
PB80-144811 ..... N80-25954 #
PB80-144878 ..... N80-25963 #
PB80-144951 ..... N80-25773 #
PB80-145113 ..... N80-26011 #
PB80-145212 ..... N80-25911 #
PB80-145337 ..... N80-25938 #
PB80-146012 ..... N80-26080 #
PB80-146152 ..... N80-26014 #
PB80-146160-SGD-423-PT-1 ..... N80-26244 #
PB80-146178 ..... N80-26245 #
PB80-146269 ..... N80-25480 #
PB80-146566 ..... N80-25377 #
PB80-146871 ..... N80-25941 #
PB80-146905 ..... N80-25919 #
PB80-147051 ..... N80-26079 #
PB80-147291 ..... N80-25775 #
PB80-147432 ..... N80-25951 #
PB80-147622 ..... N80-25481 #
PB80-147747 ..... N80-25494 #
PB80-147952 ..... N80-25585 #
PB80-147980 ..... N80-26013 #
PB80-148117 ..... N80-26019 #
PB80-148218 ..... N80-25564 #
PB80-148299 ..... N80-26012 #
PB80-148230 ..... N80-26100 #
PB80-148651 ..... N80-26026 #
PB80-148800 ..... N80-25930 #
PB80-148816 ..... N80-25931 #
PB80-148875 ..... N80-25956 #
PB80-148883 ..... N80-25956 #
PB80-148909 ..... N80-25984 #
PB80-150824 ..... N80-25772 #
PB80-150858 ..... N80-25983 #
PB80-151178 ..... N80-25942 #
PB80-151424 ..... N80-25777 #
PB80-151640 ..... N80-26025 #
PB80-152838 ..... N80-25950 #
PB80-152903 ..... N80-25593 #
PB80-153323 ..... N80-26219 #
PB80-153356 ..... N80-26015 #
PB80-153463 ..... N80-25323* #
PB80-153836 ..... N80-25807 #
PB80-154115 ..... N80-25985 #
PB80-154560 ..... N80-25952 #
PB80-155104 ..... N80-25776 #
PB80-802507 ..... N80-25980 #
PB80-802960 ..... N80-25953* #
PB80-804057 ..... N80-25719* #
PB80-804255 ..... N80-26020 #
PB80-804396 ..... N80-26107 #
PB80-804743 ..... N80-25451 #
PB80-804750 ..... N80-25452 #
PB80-804776 ..... N80-25557 #
PB80-804784 ..... N80-25558 #
PB80-804792 ..... N80-25559 #
PB80-804800 ..... N80-25770* #
PB80-805245 ..... N80-25478 #
PB80-805252 ..... N80-25479 #
PB80-805260 ..... N80-25632 #
PB80-805278 ..... N80-25633 #
PB80-805385 ..... N80-25676 #
PB80-805393 ..... N80-25677 #
PB80-805401 ..... N80-25678 #
PB80-805419 ..... N80-25679 #
PB80-805542 ..... N80-26192 #
PB80-805583 ..... N80-26189 #
PB80-805591 ..... N80-26190 #
PB80-805666 ..... N80-25303 #
PB80-805732 ..... N80-26246 #
PB80-805740 ..... N80-25771 #
PB80-805831 ..... N80-25436 #
PB80-805849 ..... N80-25437 #
PB80-805856 ..... N80-25438 #
PB80-805880 ..... N80-25560 #
PB80-805898 ..... N80-25561 #
PB80-805906 ..... N80-25442 #
PB80-805922 ..... N80-25562 #
PB80-805930 ..... N80-25563 #
PB80-805948 ..... N80-25440 #
PB80-805955 ..... N80-25441 #
PB80-805963 ..... N80-25439 #
PB80-805971 ..... N80-25674 #
PB80-805989 ..... N80-25675 #
PB80-805997 ..... N80-25555 #

PB80-806003 ..... N80-25556 #
PB80-806011 ..... N80-25434 #
PB80-806029 ..... N80-25435 #
PB80-806037 ..... N80-25586 #
PB80-806318 ..... N80-25531 #
PB80-806318 ..... N80-25532 #
PB80-806334 ..... N80-25304 #
PB80-806664 ..... N80-25342 #
PB80-806672 ..... N80-25343 #
PB80-806839 ..... N80-25497 #
PB80-806946 ..... N80-25305 #

PMEL-32 ..... N80-26014 #

PNL-SA-7600 ..... N80-25878 #
PNL-SA-8266 ..... N80-25485 #

PNL-3050-1 ..... N80-26131 #
PNL-3060 ..... N80-26132 #
PNL-3072 ..... N80-25865 #
PNL-3165 ..... N80-25705 #

PPSP/PPRP-35 ..... N80-25808 #

PR-2 ..... N80-25739* #
PR-33 ..... N80-25809 #

PSAD-80-24 ..... N80-25324 #

PT-5413 ..... N80-25545 #

PWA-5512-35 ..... N80-25340* #
PWA-5515-114 ..... N80-25332* #
PWA-5583-68 ..... N80-25333* #

QPR-3 ..... N80-25547 #

QR-1 ..... N80-25842 #
QR-1 ..... N80-25882 #
QR-1 ..... N80-25885 #
QR-3 ..... N80-25421 #
QR-8 ..... N80-25468 #
QR-8 ..... N80-25740* #
QR-9 ..... N80-25885 #

QTPR-3 ..... N80-25799 #
QTPR-3 ..... N80-25853 #
QTPR-4 ..... N80-25854 #

QTR-3 ..... N80-25329* #

QTSR-5 ..... N80-25825 #
QTSR-6 ..... N80-25820 #

R-80-008 ..... N80-25524 #
R-956 ..... N80-26100 #

RADC-TR-79-227 ..... N80-26183 #
RADC-TR-79-290 ..... N80-26141 #
RADC-TR-79-311 ..... N80-26046 #
RADC-TR-79-313 ..... N80-26195 #
RADC-TR-79-315 ..... N80-26067 #
RADC-TR-79-326 ..... N80-26074 #
RADC-TR-79-342 ..... N80-25637 #
RADC-TR-79-357 ..... N80-25362 #
RADC-TR-80-30 ..... N80-25884 #

RAE-LIB-TRANS-2034 ..... N80-26029 #
RAE-LIB-TRANS-2039 ..... N80-25696 #

RAND/N-1295-AF ..... N80-25358 #

REPT-2-30320/OR-52416 ..... N80-25380* #
REPT-3AT04G3 ..... N80-25681 #
REPT-78-FM-51-VOL-5-REV-1 ..... N80-25371* #
REPT-80-FM-24 ..... N80-25369* #
REPT-80-FM-29 ..... N80-25370* #
REPT-80-2 ..... N80-25682 #
REPT-80-16762 ..... N80-25661* #

RFP-2997 ..... N80-25420 #
RFP-2974/3533-79-2 ..... N80-25889 #
RFP-3000 ..... N80-25888 #

RLO-2230-T42-58 ..... N80-25644 #

RPI-CS-79-5 ..... N80-25416 #

RR-Q-1 ..... N80-26090 #

RR-79-9D9-HYTEM-R3 ..... N80-25419 #

RTCA-155-79/SC140-17-REV N80-25513
RTCA-305-79/SC132-54-REV-2 ..... N80-25514
RTCA-307-79/SC134-69 ..... N80-25535
RTCA-309-79/SC135-41 ..... N80-25329

RTCA/DO-164A N80-25310
RTCA/DO-168 ..... N80-25511
RTCA/DO-169 ..... N80-25510

R79AEG832 ..... N80-25944 #
R8005-2 ..... N80-25521* #
R8005-3 ..... N80-25522* #

SAAB-TN-AE-72-BT-2 ..... N80-25895 #
SAAB-TN-AE-73 ..... N80-25894 #

SAN-0004-239-T1 ..... N80-25852 #
SAN-0115-137-1 ..... N80-26129 #
SAN-0115-140-1 ..... N80-25903 #
SAN-0959-T2 ..... N80-25809 #
SAN-1241-3 ..... N80-25466 #
SAN-1483-1/1 ..... N80-25875 #
SAN-1483-1/2 ..... N80-25576 #
SAN-1483-1/5 ..... N80-25803 #
SAN-1485-T1 ..... N80-25846 #
SAN-1485-2 ..... N80-25848 #
SAN-1740-2 ..... N80-25868 #
SAN-1985-T1 ..... N80-25672 #
SAN-2073-1 ..... N80-25826 #
SAN-2207-3 ..... N80-25844 #
SAN-3042-1 ..... N80-25842 #
SAN-11276-1 ..... N80-25847 #

SAND-78-0823 ..... N80-25823 #
SAND-78-0849C ..... N80-25826 #
SAND-78-0772 ..... N80-26186 #
SAND-78-1114 ..... N80-25349 #
SAND-78-1709 ..... N80-26078 #
SAND-79-1984C ..... N80-25897 #
SAND-79-2004C ..... N80-25843 #
SAND-79-2092C ..... N80-25550 #
SAND-79-2431C ..... N80-26145 #
SAND-79-6004 ..... N80-25617 #
SAND-79-7022-VOL-1 ..... N80-25870 #
SAND-79-7038 ..... N80-26036 #
SAND-79-7048 ..... N80-25843 #
SAND-79-7058 ..... N80-25887 #
SAND-79-7089 ..... N80-25879 #
SAND-79-7127 ..... N80-25883 #
SAND-79-8062 ..... N80-25624* #
SAND-79-8065 ..... N80-25708 #
SAND-79-8260 ..... N80-26077 #
SAND-79-8286 ..... N80-26075 #
SAND-79-8276 ..... N80-25856 #
SAND-79-8288 ..... N80-25388 #
SAND-79-8715 ..... N80-25670 #
SAND-79-8754 ..... N80-25858 #
SAND-80-0057C ..... N80-25786 #
SAND-80-0109C ..... N80-25857 #
SAND-80-0154 ..... N80-25854 #
SAND-80-0158 ..... N80-26078 #
SAND-80-0309C ..... N80-25859 #
SAND-80-0429 ..... N80-26093 #
SAND-80-7004 ..... N80-25912 #
SAND-80-7005C ..... N80-25860 #
SAND-80-8206 ..... N80-26094 #

SAPR-13 ..... N80-25735* #

SC-R-70-4324 ..... N80-25526 #

SC5058.5TR ..... N80-25417 #

SDC-TM-HU-539/000/00 ..... N80-26072 #

SERI/PR-354-420 ..... N80-25929 #

SERI/TP-332-495 ..... N80-25810 #
SERI/TP-355-570 ..... N80-25800 #

SERI/TR-352-392 ..... N80-25839 #
SERI/TR-8150-1 ..... N80-26001 #

SGD-423-PT-2 ..... N80-26245 #

SIT-ME/11-79-3 ..... N80-25496 #

SLAC-219 ..... N80-26127 #

SOLAR/0902-79/70 ..... N80-25866 #
SOLAR/1010-79/50 ..... N80-25818 #
SOLAR/1011-79/14 ..... N80-25816 #
SOLAR/1015-79/50 ..... N80-25821 #
SOLAR/1057-79/14 ..... N80-25820 #
SOLAR/1090-79/50 ..... N80-25819 #

SORI-EAS-79-415 ..... N80-25958 #

SR-1 ..... N80-25977 #
SR-2 ..... N80-25381 #
SR-2 ..... N80-25978 #
SR-79-R-4650-09 ..... N80-25955 #

SRC-79-TR-45 ..... N80-25862 #

SRD-79-134/1 ..... N80-26206* #
SRD-79-134/2-APP-A ..... N80-26207* #
SRD-79-134/3-APP-B-VOL-1 ..... N80-26203* #
SRD-79-134/4-APP-B-VOL-2 ..... N80-26204* #
SRD-79-134/5-APP-B-VOL-3 ..... N80-26205* #
SRD-79-134/6-APP-C ..... N80-26208* #
SRD-79-134/7-APP-D ..... N80-26209* #

SRO-0893-17 ..... N80-25869 #

SSL-SER-20-ISSUE-42 ..... N80-25734* #

SU-DSE-4042-T18 ..... N80-25547 #

TDWR/LP-110 ..... N80-26009 #
TDWR/LP-112 ..... N80-26010 #
TDWR/LP-117 ..... N80-26013 #

TES-33009-45 ..... N80-25832 #
TES-33009-47 ..... N80-25833 #
TES-33009-50 ..... N80-25834 #
TES-33009-51 ..... N80-25835 #

TM-06 ..... N80-25840 #

TN-1979-45 ..... N80-25527 #
TN-1979-82 ..... N80-25528 #

TPR-2 ..... N80-25871 #

TR-3 ..... N80-25840 #
TR-31 ..... N80-25924 #
TR-241 ..... N80-25616 #
TR-843 ..... N80-25636 #
TR-7820-VOL-2 ..... N80-25307 #
TR-7823-VOL-5 ..... N80-25308 #

TRB/TRR-729 ..... N80-26079 #

TRW-30491-6014-RU-00 ..... N80-25543 #
TRW-33682 ..... N80-25797 #

TSR-79-0002 ..... N80-26095 #

TUM-LRT-KD-78/1 ..... N80-25375 #

T79-12405 ..... N80-25371* #

UCID-18149 ..... N80-25981 #
UCID-18489 ..... N80-25404 #
UCID-18513 ..... N80-26106 #
UCID-18548 ..... N80-25469 #
UCID-18561 ..... N80-25893 #

UCRL-TRANS-11510 ..... N80-25458 #
UCRL-TRANS-11535 ..... N80-25431 #

UCRL-15037 ..... N80-25868 #
UCRL-15098 ..... N80-26144 #
UCRL-15162 ..... N80-26005 #
UCRL-15186 ..... N80-26037 #
UCRL-15190 ..... N80-25880 #
UCRL-50021-78-VOL-1 ..... N80-25652 #
UCRL-50021-78-VOL-2 ..... N80-25651 #
UCRL-50021-78-VOL-3 ..... N80-25650 #
UCRL-50058-79-3 ..... N80-25376 #
UCRL-52719-VOL-1 ..... N80-26133 #
UCRL-52723 ..... N80-25714 #
UCRL-52728 ..... N80-25432 #
UCRL-52841-VOL-3 ..... N80-26213 #
UCRL-52867 ..... N80-25529 #
UCRL-52920 ..... N80-25530 #
UCRL-82275 ..... N80-25653 #
UCRL-82296-REV-2 ..... N80-25641 #

UCRL-82765 ..... N80-26165 #
UCRL-83458 ..... N80-25905 #
UCRL-83609 ..... N80-25619 #

UILU-ENG-79-4012 ..... N80-25669 #
UILU-ENG-80-2501 ..... N80-25964* #
UILU-ENG-80-2502 ..... N80-26242* #

UM-HSRI-79-88 ..... N80-25200 #

US-PATENT-APPL-SN-145208 ..... N80-25693* #
US-PATENT-APPL-SN-154725 ..... N80-25660* #
US-PATENT-APPL-SN-154726 ..... N80-25536* #

USAAMRDL-TR-71-22 ..... N80-25307 #

USAAVRADCOM-TM-80-D-5 ..... N80-25540 #

USAMRDL-TR-71-22 ..... N80-25308 #

USARTL-TR-78-39 ..... N80-25665 #
USARTL-TR-79-22B-VOL-2 ..... N80-25307 #
USARTL-TR-79-22E-VOL-5 ..... N80-25308 #

USGS-818-A ..... N80-25684 #

USGS/GD-80/003 ..... N80-25965 #

UTC-FCR-1332 VOL-1 ..... N80-25792* #
UTC-FCR-1333-VOL-2 ..... N80-25793* #
UTC-FCR-1333-VOL-4 ..... N80-25794* #
UTC-FCR-1333-VOL-6 ..... N80-25795* #

UTRC-R80-914607-12 ..... N80-25453* #

UWFDM-337 ..... N80-26138 #

VHTRC-80-R2 ..... N80-25932 #

WAES-TNR-237-VOL-1 ..... N80-25686 #

WAPD-TM-1430 ..... N80-25673 #

WASH-2330-78/4-VOL-2 ..... N80-25838 #
WASH-2330-78/4-VOL-3 ..... N80-25837 #
WASH-2330-78/4-VOL-4 ..... N80-25836 #

WES-MP-M-78-4 ..... N80-25639 #

WES-MP-0-79-4 ..... N80-26073 #

WHOI-80-3 ..... N80-26025 #
WHOI-80-6 ..... N80-26026 #

WP-17 ..... N80-26194 #

WSRL-0069-TR ..... N80-25587 #

W80-02803 ..... N80-25949 #
W80-02761 ..... N80-25406 #
W80-03644 ..... N80-25942 #
W80-03648 ..... N80-25983 #
W80-03710 ..... N80-25777 #

* U. S. GOVERNMENT PRINTING OFFICE : 1980 311-442/16

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to eleven special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley
COLORADO
University of Colorado, Boulder
DISTRICT OF COLUMBIA
Library of Congress
GEORGIA
Georgia Institute of Technology, Atlanta
ILLINOIS
The John Crerar Library, Chicago
MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge
MISSOURI
Linda Hall Library, Kansas City
NEW YORK
Columbia University, New York
OKLAHOMA
University of Oklahoma, Bizzell Library
PENNSYLVANIA
Carnegie Library of Pittsburgh
WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library
COLORADO
Denver Public Library
CONNECTICUT
Hartford Public Library
MARYLAND
Enoch Pratt Free Library, Baltimore
MASSACHUSETTS
Boston Public Library
MICHIGAN
Detroit Public Library
MINNESOTA
Minneapolis Public Library
MISSOURI
Kansas City Public Library
St. Louis Public Library
NEW JERSEY
Trenton Public Library
NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library
OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library
TENNESSEE
Memphis Public Library
TEXAS
Dallas Public Library
Fort Worth Public Library
WASHINGTON
Seattle Public Library
WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy of microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESA - Information Retrieval Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

National Aeronautics and
Space Administration

Washington, D.C.
20546

Official Business
Penalty for Private Use $300

SPECIAL FOURTH CLASS MAIL
Book

Postage and Fees Paid
National Aeronautics and
Space Administration
NASA-451

POSTMASTER: **If undeliverable (Section 158
Postal Manual) Do Not Retur**